AVIATION WEEK

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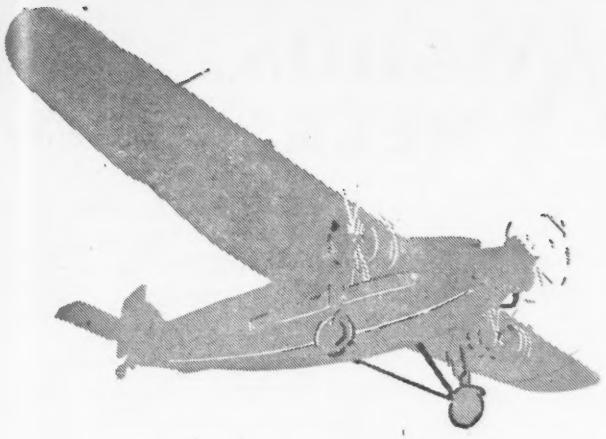

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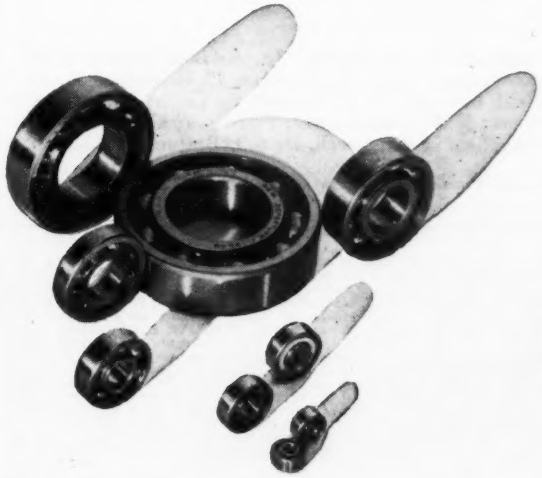

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Vol. 51, No. 4

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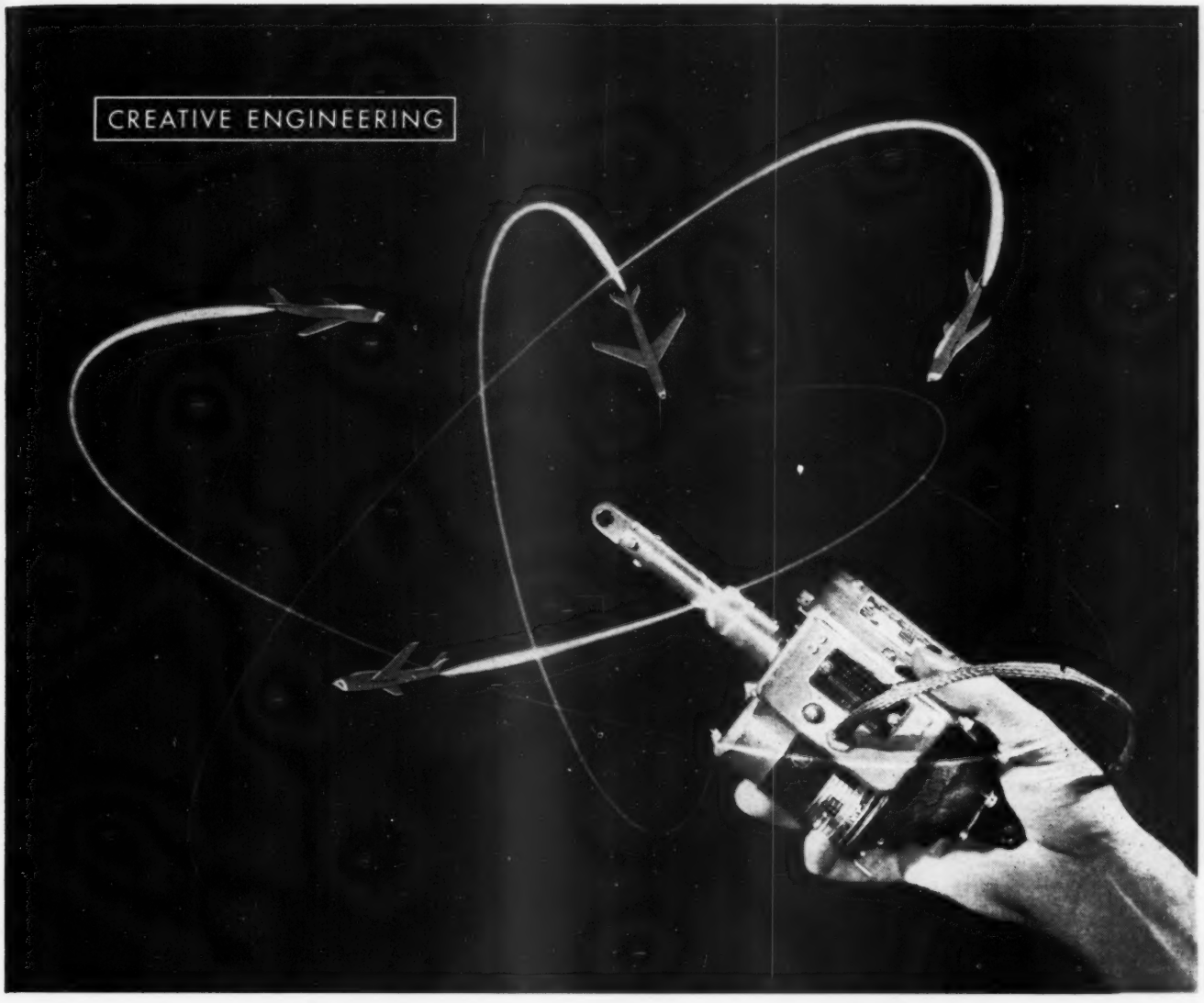

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More Lessons From the Airlift—An Analysis

At latest reading the Berlin airlift had moved a total of 2,098,887 tons of supplies to the German capital. Of this total U. S. Air Force transports delivered 1,609,749 tons during 172,044 flights and 530,891 hours of flying time. Cost of the U. S. share of this enterprise now stands at 31 airmen dead; $238,140,100; and 34 transports wrecked (25 Douglas C-54, 8 Douglas C-47 and one Fairchild C-82). During the early weeks of July USAF transports were delivering an average of 6500 tons per day to Berlin, an intensity of operations not far from the peaks attained while the blockade was tightest.

Although the Russian blockade of Berlin was officially lifted May 12, harassments of various sorts have kept surface traffic from the Allied Western Zone of Germany into the Russian Zone and Berlin far below their normal levels. It is quite evident that having lost the showdown on the complete blockade of Berlin by virtue of the Allied airlift, the Russians now plan a guerrilla action to snipe at the inter-zone communications.

Allied plans on the future of the airlift indicate that it will be reduced in scope (some sources say by two-thirds) to effect some economy in operations. However it seems likely that the basic organization for at least the U. S. portion of the airlift and most of its personnel and planes will continue on duty as insurance against a shift in the Russian wind.

Many lessons have been drawn from the 13-month experience of the airlift. For example it should be obvious by now that any successful air transport operation must be based on a solid, efficient foundation of surface transportation. The role of the Navy in shipping aviation gas to Germany, and the Army in supplying rail and truck transport to the airheads, has been vastly underemphasized in viewing the more spectacular drama of the 350-mile air haul.

Also important have been the giant strides of the airlift's trans-Atlantic air support operations that made it possible for engines worn out over Germany to be overhauled in San Antonio; transports battered on the Frankfurt-Berlin haul to be reconditioned in Dallas, Burbank and Oakland; and crews to be trained for Operation Vittles in Great Falls, Mont. The large, long-range strategic transports (Douglas C-74, Boeing C-97 and the Lockheed C-121A) have proved out in the air support operations for vittles.

Perhaps of even more importance has been the clear-cut lesson of how a great air effort aimed at implementing national policy has its roots deep in the civil aviation of a country. The relation of a country's air potential to its civil aviation resources has often been discussed but never so clearly demonstrated as in the Berlin airlift.

For early air support operations the Military Air Transport Service had to rely heavily on both scheduled and nonscheduled international carriers such as Seaboard & Western, Transocean, American Overseas, Alaska Airlines and Pan American. When the Air Materiel Command maintenance depots proved inadequate to handle the swift and efficient reconditioning of airlift transports it was the civilian maintenance contractors such as TEMCO, Lockheed Air Service and Transocean that again shored up the sagging structure of the airlift.

The record of the civilian maintenance contractors compared with the cumbersome AMC depots raises the question of how much more of this type work should be used to build up adequate civil reserves for emergency use rather than maintaining an expensive and not too efficient military depot system. The military certainly need some sort of maintenance organization under their own wing. But, as was suggested to the President's Air Policy Commission, squeezing the water out of the military maintenance system and insuring an adequate reserve of civil maintenance facilities available for military use may be a cheaper, more efficient and sounder approach to the problem.

When the need for transport pilots and crews became acute the crisis was met by civil airlines pilots furloughed by the airlines and reservists returning to active duty from civil life. Fortunately the war-filled reservoir of trained aviation personnel both for flight and ground duties is still large, but with each passing year its level decreases. There has been no sign of any development of a national policy aimed at eventual replenishment of this reservoir when it runs dangerously low.

There has been considerable talk about the value of civil aviation to the total airpower of a country. Everybody coming to Washington seeking a subsidy for his particular enterprise tries to hang the "national defense" tag on his effort. However there seems to be a very urgent need for formulation of a national air policy that will evaluate the real elements of this country's airpower and fit them into their proper place. Neither the President's Air Policy Commission nor the Congressional Air Policy Board went much beyond the strictly military phases of U. S. air policy. It is obvious that this country cannot maintain during peacetime a standing Air Force and Naval Aviation large enough to deal with any wartime emergency.

Perhaps if there were more effort devoted to building up the broad foundations of airpower that could pay their way at least partially through commercial operations it would be easier to sell both the country and the Congress on paying the remaining bill for military aviation.

Much of the content of "The Lesson of the Airlift," appearing on this page Aug. 30, 1948, originated from manuscripts by Lieut. Col. Edwin F. Black, of the U. S. Army, and Langdon P. Marvin, Jr. At that time it was the intention of Aviation Week *to publish more complete articles by both of these authorities, based on the manuscripts. Circumstances have prevented such publication, however, and* Aviation Week *wishes to give proper credit to Lieut. Col. Black and Mr. Marvin at this time.*

Lieut. Col. Black, who had titled his manuscript, "A Comparison of Air and Sea Transportation," is currently on duty with the Office of the Secretary of Defense. Mr. Marvin in recent months has been writing a book on international air cargo, tentatively titled, "The New Sea." More recently, he has assisted the Senate Interstate and Foreign Commerce Committee in preliminary studies looking toward legislation authorizing a federal program to build up a fleet of cargo aircraft. During the war he was chairman of the Interdepartmental Air Cargo Priorities Committee.

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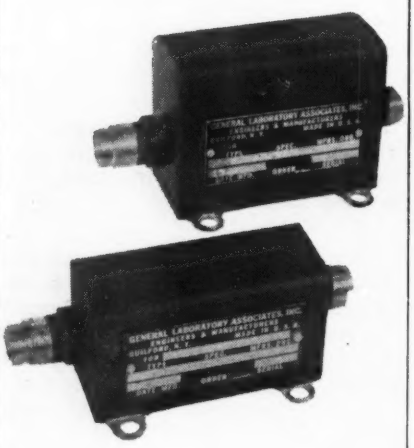

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July 26-27—Air Force-Navy-industry meeting on revision of ANS-52A (machine screw), Tempo "U" Bldg., Wash., D. C.

Aug. 3—Forum, Corporation Aircraft Owners Assn., Hotel Statler, Washington, D. C.

Aug. 6-7—Second annual International Air Fair sponsored by Aero Club of Michigan, Willow Run Airport.

Aug. 6-14—1949 West Coast soaring championship, Palmdale Airport, Calif.

Aug. 7-14—Second annual southwestern soaring contest, NTAC airport, Grand Prairie, Tex.

Aug. 22-23—ARTC, western division meeting, Boeing plant, Seattle, Wash.

Aug. 23-26—American Institute of Electrical Engineers, Pacific general meeting, Fairmount Hotel, San Francisco.

Aug. 25-28—Flying Farmers national convention, Fort Collins, Colo.

Aug. 29-Sept. 1—Acromedical Assn., annual meeting, Statler Hotel, N. Y.

Sept. 1-7—International conference of Federation Aeronautique Internationale, Wade-Park Manor, Cleveland, Ohio.

Sept. 3-5—1949 National Air Races, Cleveland, Ohio.

Sept. 6-8—Annual spark plug and ignition conference, sponsored by Champion Spark Plug Co., Hotel Secor, Toledo, Ohio.

Sept. 7-11—10th Society of British Aircraft Constructors flying display and exhibition, Farmborough Airfield, Hampshire, England.

Sept. 9-12—Clinic on maintenance of industrial instruments, Instrument Society of America, Statler Hotel, St. Louis.

Sept. 18-20—International Northwest Aviation Council convention, Spokane, Wash.

Oct. 3-8—Twentieth anniversary meeting, Ninety-Nines, Waldorf-Astoria, New York.

Oct. 5-8—SAE national aeronautic meeting and aircraft engineering display, Biltmore Hotel, Los Angeles.

Oct. 30—Third annual San Francisco Air Fair, sponsored by Junior Chamber of Commerce, San Francisco Airport.

Oct. 30-Nov. 2—Annual convention, National Assn. of State Aviation Officials, New Orleans.

Nov. 9-11—Seventh annual meeting Aviation Distributors and Manufacturers Assn., French Lick Springs Hotel, French Lick, Ind.

Jan. 13-15, 1950—All-American Air Maneuvers, Miami.

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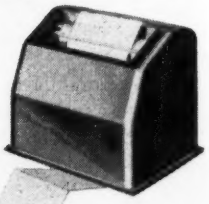

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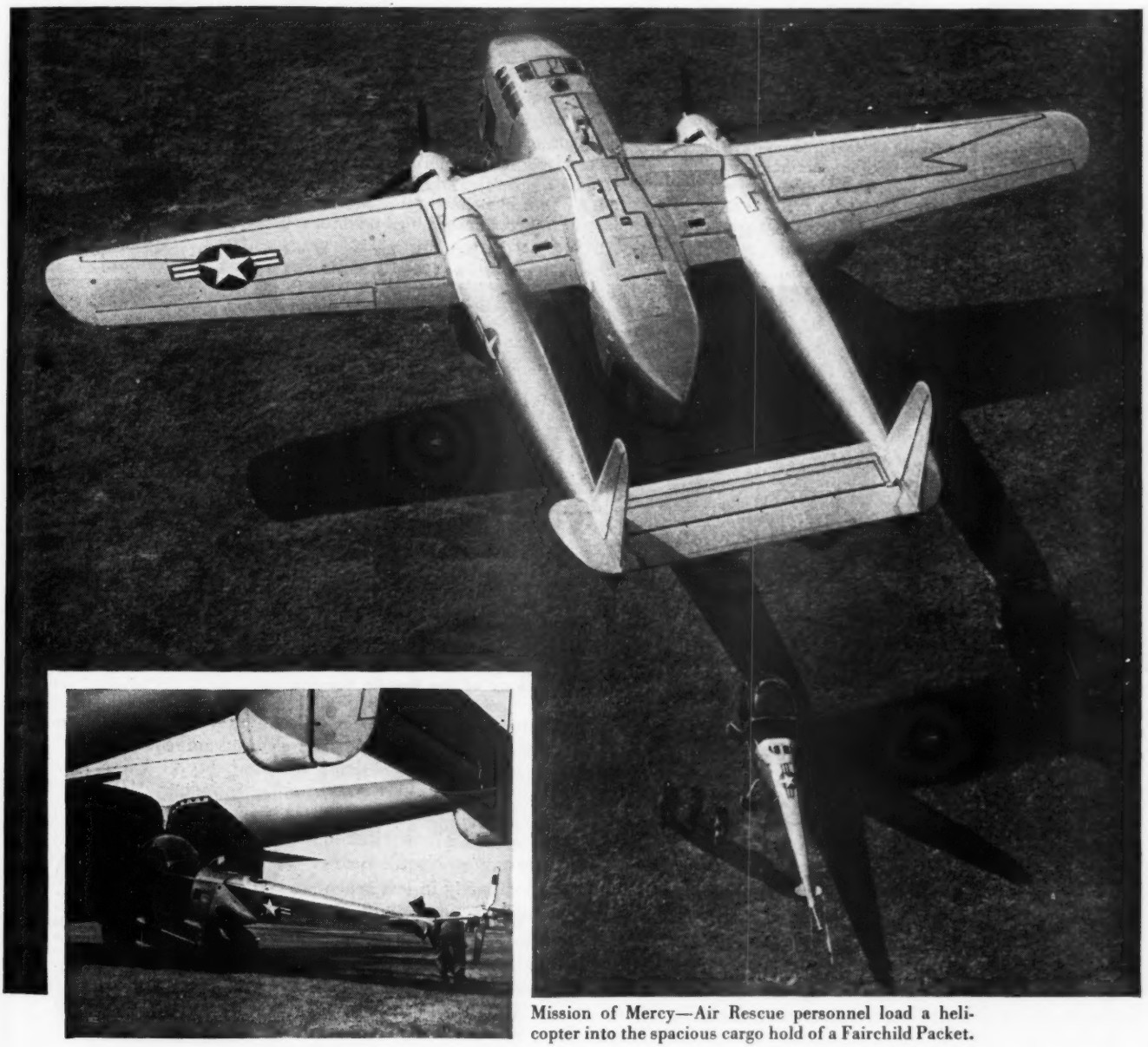

Mission of Mercy—Air Rescue personnel load a helicopter into the spacious cargo hold of a Fairchild Packet.

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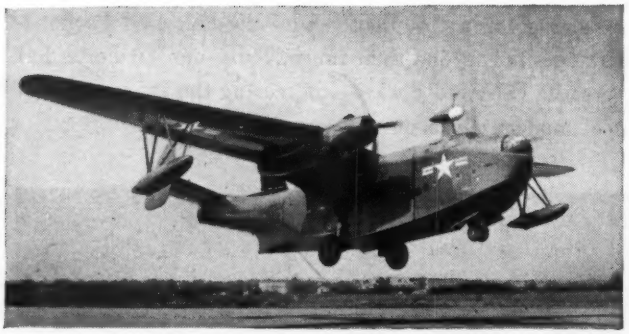
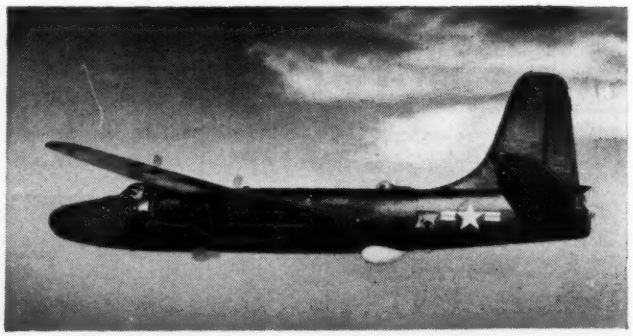
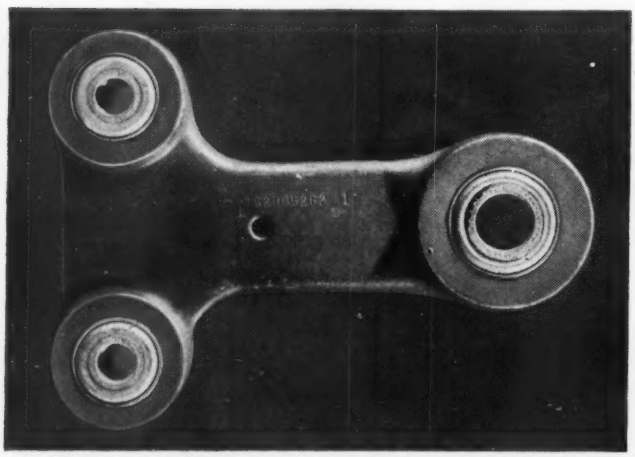
Torrington Needle Bearings reduce deadweight in Martin airplanes

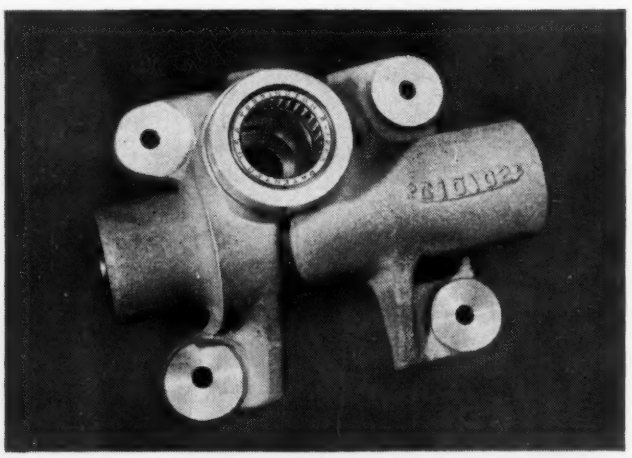




The Glenn L. Martin Company trims every possible fraction of an ounce of deadweight from its airplanes without sacrificing reliability and efficient performance. Torrington Needle Bearings are among many design refinements applied to the PBM-5A *(left)* the world's largest amphibian, the P4M-1 Mercator *(right)* Martin's long range patrol plane, and other Martin aircraft. Providing tremendous radial capacity, these efficient anti-friction bearings perform reliably with minimum maintenance.



Typical is this application of three Needle Bearings with integral races to the PBM-5A idler crank of the cowl flap operating mechanism. One advantage of this design is its provision for a large reserve of lubricant, reducing the frequency of service attention required.



Close-up of the Needle Bearing installed in the housing control lock mechanism of the Martin P4M-1 Mercator shows the compact, lightweight construction possible. With a hardened and ground shaft for an inner race, no other elements are required.

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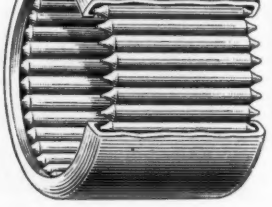

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NEWS DIGEST

DOMESTIC

Fairchild Engine & Airplane Corp. board of directors elected James A. Allis chairman. Other officers, in addition to Richard S. Boutelle, president (AVIATION WEEK, July 18), include: Arthur F. Flood, vice president, comptroller and treasurer; George F. Chapline, Ranger division vice president; Myron B. Gordon, vice president; Turner A. Sims, NEPA division vice president; and Paul S. Cleaveland, secretary. Plan to to reduce drastically the number of New York personnel, and move the remainder to Hagerstown early in September.

American Overseas Airlines has its Stratocruiser on an eight-day "shakedown" flight, with stops planned at Gander, Shannon, London, Zurich and Frankfort.

Nonsked C-46 of Air Transport Associates, carrying 32, crashed into an apartment house just after takeoff from Boeing Field, Seattle. Early reports said that of six fatalities, three were aboard plane, the others apartment residents. Thirty-three were reported injured.

Twenty-three day strike of truck drivers for Willis-Rose Corp. at Idlewild Airport ended last week. Teamsters Union agreed to accept a $1.50 an hour flat rate wage. Previous rates ranged from $1.10 to $1.35.

Manufacturing backlog as of March 31, 1949, totaled $2,991 million, Census Bureau reports. Orders for complete aircraft and parts comprised 67 percent. Backlog on Dec. 31, 1948, was $3,106 million which in turn was a drop from the $3,236 million on Sept. 30, 1948.

FINANCIAL

Beech Aircraft Corp. board of directors voted a quarterly dividend of 25 cents per share, payable Aug. 5 to stockholders of record July 25. Beech backlog is about $10 million. Sales for nine-month period ended June 30 totaled $15,845,938, including non-aviation commodities.

G. M. Giannini & Co., Inc., reported total sales of $1,072,164 for 1948, a gain of $199,246 over 1947. Manufactured products accounted for 70 percent of total sales.

INTERNATIONAL

KLM will discontinue its alternate route from Amsterdam to Batavia via Cairo, Aden and Mauritius. Thrice-weekly service to Indonesia will be flown via Cairo, Karachi and Bangkok since Pakistan government lifted the ban imposed six months ago on all Dutch air transport services following Netherlands action in Indonesia.

INDUSTRY OBSERVER

► Convair B-36D prototype successfully completed its first test flight using the General Electric J-47 turbojet engines in the two outboard wing pod nacelles. The J-47 engines replaced the four Allison J-35-19 turbojets originally used on the B-36D. Total take-off thrust from the four turbojet engines was raised from 19,600 lb. to 20,800 lb. by the switch. Production model B-36Ds will be equipped with the J-47 series.

► Douglas Aircraft Corp. has completed mating of the wing and fuselage of its prototype C-124A transport. The completed transport is scheduled to fly in November with production on the initial USAF order of 28 beginning before the year's end.

► Cornell Aeronautical Laboratory has developed fiberglas helicopter blades that have shown indications of aerodynamic and structural superiority over some conventional type blades. The fiberglas blades were recently test flown successfully at Wright-Patterson AFB. The blades are 22 ft. long with an average width of 20 in. The blades are moulded in a single operation and utilize a "sandwich" type construction with a balsa wood core.

► American observers will be watching with interest the British closed-course jet race scheduled for Aug. 1 over a quadrangular 20-mile course. Entries include a de Havilland Vampire, Gloster Meteor, Hawker P-1040, de Havilland 108, and the Vickers-Armstrong Swift. There has been no closed-course jet racing in the United States since the hair-raising jet Thompson Trophy scramble at the 1947 air races at Cleveland when USAF pilots competed in Lockheed F-80s.

► Pratt & Whitney JT-6B Turbo-Wasp has been certificated for civil use by the Civil Aeronautics Administration. The 5000-lb. thrust engine is the P&W version of the British Rolls-Royce Nene. British Nene is now installed experimentally in several British commercial transports. Only other U. S.-manufactured jet available for civil use is the Allison J-33-A21 rated at 4000 lb. thrust. The P&W version of the Nene (J-42) will be superseded for U. S. Air Force and Navy use by the Tay (J-48), a more powerful centrifugal flow turbojet.

► McDonnell Aircraft Corp. engineers are readying two midget racers for the 1949 Goodyear trophy race at Cleveland in September. A shoulder wing pusher is under construction by a group headed by missile engineers George Owl and Bob Short, and Errol Painter, a Banshee (F2H) designer. Second entry will be a mid-wing monoplane built by Larry Reithmaier of MAC's power plant division.

► Pratt & Whitney's new R-2180 Twin Wasp engine rated at 1650 hp. is getting its initial flight tests on a Northrop F-61 at East Hartford, Conn. The R-2180 has been ordered by USAF for use in a new Piasecki helicopter, by SAAB for use in the Swedish Scandia transport, and may figure in a DC-4 and C-54 power conversion program proposed by Douglas Aircraft Corp.

► Production version of the Northrop XF-89 twin-jet night fighter will be powered by two General Electric J-47 5200 lb. turbojets instead of the Allison J-35 engines used in the experimental models. USAF contract for initial production of 48 F-89As was negotiated at a price of about $800,000 apiece including government-furnished equipment. Northrop was originally scheduled to get an additional order for 143 F-89As out of fiscal 1950 procurement funds. Latest revision of USAF 1950 procurement schedule has reduced the F-89A quota considerably as the USAF trend to smaller and lighter night fighters becomes more pronounced.

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AVIATION WEEK

July 25, 1949

GLENN MARTIN hands controls to . . .

. . . C. C. PEARSON in transfusion move.

Martin Top Management Changes

President becomes board chairman as Pearson takes presidency. Outlook brighter with new 2-O-2 orders.

By Robert B. Hotz

Shift in top level management of the Glenn L. Martin Co. of Baltimore was announced last week. The official Martin announcement confirmed predictions of the impending shift published in AVIATION WEEK April 11 and widely denied at that time.

Principal results of the shift are:

• **Glenn L. Martin,** head of his own company for 40 years, relinquished active leadership of the firm leaving the presidency to become chairman of the board.

• **C. C. Pearson,** former Douglas and Curtiss-Wright executive, succeeds Martin as president and general manager of the company. He was also elected a director. Pearson was with Douglas for 16 years and was manager of the Douglas Oklahoma City plant during the war. More recently he was manager of the Curtiss-Wright airplane division at Columbus, Ohio, and a vice president of the Curtiss-Wright Corp. He resigned from Curtiss two months ago.

• **Harry T. Rowland** resigned as executive vice-president and director.

• **Morgan Schermerhorn, Jr.,** resigned as vice-president, controller and director.

• **Daniel A. Evatt,** treasurer, was named vice-president in charge of finance. W. L. Lucas replaced Evatt as treasurer.

The Martin Co. gave no specific reason for the top level management shift but a company spokesman indicated it resulted primarily from Glenn L. Martin's desire to pass on active management of the company to a younger man. Preliminary discussions with Pearson were begun nearly a year ago.

There have been persistent rumors that both Air Force and Navy were unhappy over the post-war management of the Martin Co. and had been pressing for a top level change. Reconstruction Finance Corp. which loaned the Martin Co. a total of $28 million during the past two years, also made suggestions regarding the Martin management.

▶ **First Half Profit**—Coincident with the management changes the Martin Co. announced a net income of $976,974 for the first half of 1949 in contrast to a net loss of $719,034 for the same period in 1948. Net sales for the first six months of 1949 were $23,032,953 compared with $26,688,328 for the same period in 1948.

Martin officials believe the company has a good chance to finish the year in the black for the first time since the end of the wartime boom. Martin's last annual statement listed total current assets of $26,123,012 plus plant and property valued at $15,780,849.

▶ **Owe RFC $11 Million**—As of June 30 the company owed the RFC $11.9 million and expected to make payments of more than $1 million during July and August.

Company possessed a cash balance of $9.7 million of which $3.4 million was restricted to use in connection with RFC obligation and $6.3 million was unrestricted.

The company has applied for another RFC loan of $500,000 which will be used primarily as a rotating fund to replace inventories and equipment sold on which RFC had a lien and the proceeds were required by RFC.

▶ **Increase Reserve**—The company has also made an increase of about $2.2 million in its renegotiation reserve for 1945 after discussions with the Military Renegotiation and Policy Board. This reduced net earned surplus for the first six months of 1949 by $1,201,137.

Martin's current position is based on the following factors:

• **Aircraft**—Production order for 150 Maulers (AM-1) is scheduled for completion in September. Production has just begun on an order of 19 Mercators (P4M-1) a four engine patrol bomber. Cut in Navy funds for fiscal 1950 cost Martin an additional order for 17 Mercators.

The Navy Dept. has advanced production engineering funds for the P5M-1 a twin engine flying boat featuring an unusually long afterbody. Company is also nearing completion of the XB-51 a swept-wing triple jet light bomber for the Air Force. P5M and B-51 are Martin's best bets for future military aircraft production.

After a stormy two years, the model 2-O-2 transport appears to be coming back into the picture. Martin is setting up its 2-O-2 production line again and has additional orders from Ethiopian Air Lines, a TWA subsidiary, and KLM, the Dutch national air line. These orders are expected to mean production of at least another dozen

2-O-2 transports. Martin has by no means given up on domestic airlines that have not yet purchased twin engine replacements for their DC-3 equipment.

• **Special Weapons.** Martin has one of the largest guided missile engineering and production staffs in the industry. It has production contracts on two missiles—one a Navy target device and the other an Air Force tactical missile. It is building a series of high altitude research rockets for the Navy and expects to figure prominently in the rapidly developing missile field.

• **Electronics.** Martin has specialized in design of electronic fire control systems and production of power-driven aircraft gun turrets. Current turret production involves equipment for the Mercator and the Lockheed Neptune (P2V) patrol bomber. Engineering work is progressing on several new fire control systems for high speed air craft.

Stratovision, an airborne television relay station was developed for both military and commercial use.

• **Chemical Division.** Plant at Painesville, Ohio, is producing Marvinol, a vinyl resin powder widely used in the manufacture of plastic products.

• **Rotawings Division.** Originally planned as Martin's helicopter division, Rotawings has been absorbed back into the main Martin engineering department and is relatively inactive at the present time.

Report on December Nonsked Plane Loss

Official investigation into the disappearance of a nonscheduled DC-3 while on a flight from San Juan, Puerto Rico, to Miami last Dec. 28 has failed to shed much light on the mystery.

The plane, owned by Karl Knight, Miami, and leased to Airborne Transport, Inc., New York, was carrying 29 passengers and a crew of three when it was lost on the over-water hop.

Civil Aeronautics Board said it lacked sufficient information to determine the probable cause of the accident. But it noted that the plane did not meet the requirements of its operating certificate when it took off from Puerto Rico.

► **Batteries Low**—When examined at San Juan, the DC-3's batteries were found in a discharged condition. Advised that it would take several hours to recharge the batteries to proper operating capacity, the pilot asked a mechanic to add water and return them to the aircraft without recharging.

With the batteries run down, the plane's electrical system including the transmitter, was malfunctioning at the time of departure from San Juan for Miami. Contradictory weight and balance and passenger manifests indicated the DC-3 was 118 lb. overloaded. The company's maintenance records were incomplete.

► **Flight Cleared**—The flight was cleared VFR orally with the understanding that it remain in the vicinity of San Juan until able to contact the tower, at which time an IFR flight plan to Miami would be approved when filed. Basis of this agreement was the belief that the aircraft's generators would shortly produce sufficient current capacity to allow transmission.

But the plane took off and without further contact with the tower continued on course. The pilot advised CAA communications at San Juan he was unable to contact the tower and was proceeding IFR to Miami.

Last reported position of the plane was 50 miles south of Miami.

Air Safety Board

Legislation setting up a five-member independent air safety board to take over the safety activities of the Civil Aeronautics Board and the Civil Aeronautics Administration was introduced last week by Chairman Robert Crosser (D., Ohio) of the House Interstate and Foreign Commerce Committee.

The measure has a fair chance for enactment at this session. Chairman Ed Johnson (D., Colo.) of the Senate Interstate and Foreign Commerce Committee favors an independent board. However, there is sentiment in Congress against making organizational changes not in line with the recommendations of the Hoover Commission.

CONVAIR'S GIANT FLYING BOAT

New view of the giant Convair flying boat XP5Y-1 on the ramp at San Diego awaiting the four Allison T-40 turboprops with which it will be powered. The 5500 hp. T-40 is currently undergoing testing by Allison at Indianapolis and is expected to be delivered to Convair late in the summer. Blisters bulging just below the cockpit and at the base of the dorsal fin are remotely controlled gun turrets. The 138,000-lb. flying boat is expected to have a top speed of close to 400 mph.

Sub Killer

Navy looking for new plane that combines big load with great agility.

Navy is in the market for an anti-submarine warfare plane that can combine the functions of locating and killing a submarine.

Currently the Navy hunter-killer system uses one type of plane as the hunter to locate a submarine and another type as the killer to attack and destroy it. This system was successful against World War II type submarines but has serious limitations against the faster "schnorkel" submarines now coming into operational use with the Russian navy.

▶ **Combination Stymied**—Combination of the two functions in a single plane is now stymied by the large payloads required for electronic search gear and combat load of depth charges, bombs and rockets. By the time the current type hunter planes are loaded with all the electronic gear required there is no payload left for anything but crew, fuel and light defensive armament.

Biggest space and weight factor in the electronic load is the sonar buoy. The buoys are dropped from the search plane in a pattern aimed at enclosing the area in which a submarine is maneuvering. The buoys send out an underwater signal that bounces off a submarine hull and is automatically transmitted by the buoy to the search plane. In this manner even the submerged movements of a submarine can be traced. However to make an effective pattern a large quantity of sonar buoys must be carried by search planes.

Other equipment includes a new type of search radar that is more effective in picking up the "schnorkel" breathing tube on the surface and the receiving and plotting equipment for use with the sonar buoys.

▶ **Miniature Electronics**—One of the big answers to the ASW problem, Navy airmen feel, is miniaturization of electronic equipment about which there is currently much talk and research but little action on a production basis. The other answer is better designed planes that are tailored more specifically to their ASW tasks.

In addition to the large cargo volume capacity required for sonar buoys an ideal ASW plane would have to have a low wing loading to enable it to maneuver easily at relatively low speeds. This is necessary for the killer function since, once a sonar buoy contact with a submarine is made, the killer plane must maneuver around the buoy on an extremely short turning radius at low speeds to get into position for an attack.

▶ **Jeep Limitations**—Another limitation in the foreseeable future is the necessity of operating at least one type ASW plane off the "jeep" carriers built during the last war. The length of the jeep carrier's flight deck and its relative instability in heavy seas will be serious limitations on plane design until better carriers are available for ASW functions.

Although ASW is currently the Navy's top priority mission assigned by the Joint Chiefs of Staff, some Naval airmen feel that the air aspects of this mission are not being given the priority they deserve. Navy currently has 124 ASW planes on order. These are:

- **53 Grumman AF-1**
- **52 Lockheed P2V-4**
- **19 Martin P4M-1**

A $300 million procurement item to buy an additional 446 ASW planes was knocked out of the Bureau of Aeronautics budget during Navy-Budget Bureau discussions. Attempts to add the $300 million procurement item during debate on the fiscal 1950 military appropriations bill were defeated by a vote on the House floor. These 446 ASW planes include:

- **228 Grumman AF-1**
- **45 Lockheed P2V-4**
- **17 Martin P4M-1**
- **156 Douglas AD-3**

With the current congressional drive for general economy and a large specific cut in the military budget for fiscal 1950 there is little chance of these procurement funds being restored in the Senate. As the fiscal 1950 Navy budget now stands, procurement of 843 new planes for Naval Aviation is authorized.

B-36 Probe

House Armed Services Committee investigation into the B-36 and other aspects of U. S. Air Force and Naval Aviation policy is scheduled to begin July 26.

Hearings will be open to the public. Most of the preliminary work on the probe has been handled by committee chairman Carl Vinson (D., Ga.). Committee counsel Joseph Keenan did not take over his job until last Thursday after U. S. Air Force, Navy, Army and other agencies concerned had submitted comprehensive reports to Vinson on the subjects to be aired during the investigation.

USAF Funds Cut

Senate Appropriations Committee has voted to cut back the 57-group Air Force program, proposed for the coming year by the House, to the 48-group program recommended by the Administration (AVIATION WEEK, July 4).

The committee trimmed $222,067,000 cash and $577,755,000 contract authorization off of the USAF budget. It approved a cash allocation for USAF of $4,000,887,000 (compared with the $4,222,954,000 approved by the House) and contract authorization of $1,415,000,000 (compared with the $1,992,775,000 approved by the House).

The committee also approved Defense Secretary Louis Johnson's proposal to transfer funds in the Navy's budget for construction of the 65,000-ton carrier, United States, now cancelled, to renovation of two 27,000-ton carriers to accommodate recent plane types.

NEW CANADIAN LIGHT PLANE

Found Brothers Aviation Co. Ltd.'s FBA-1A, prototype of which is shown above, recently completed its first test flight at Malton Airport, near Toronto, Canada, with S. R. Found at the controls. Aircraft is designed to meet the demands of the Canadian bush and will be equipped with wheels, floats or skis. Craft is powered by a 145 hp. Gipsy Major IC. FBA-1A seats four and carries 35 gal. of gasoline in two wing tanks. Span of the aircraft is 30 ft., length 25 ft., height 9 ft.

Plane Rules

Ruling by Cleveland Municipal Airport director Jack Berry barring all lightplane traffic during the National Air Races, Sept. 3-5, has been modified to permit use of the field for all transient lightplanes equipped with two-way radios.

Parking and tie-down facilities during the three-day racing period will be restricted to multi-engine planes. Facilities for handling nearly 1000 single engine planes will be provided at Cleveland's lakefront air strip with a 25-cent bus service from the strip to the races. Arrangements have also been made to accommodate single engine planes at the Akron Municipal Airport with bus service to the races.

Construction work at the north end of the Cleveland Municipal airport is responsible for the restrictions on lightplane parking during the racing program.

Need More Sheet Magnesium Capacity

U. S. Air Force and Navy are looking for additional magnesium rolling mill facilities to ease a threatened shortage in sheet magnesium for aircraft production.

Sheet magnesium is required in considerable quantity for the USAF B-36 made by Convair at Ft. Worth and the Navy's F7U-1 manufactured by Chance Vought at Dallas.

▶**New Firm**—In addition to easing a tight material shortage the military want more magnesium handling facilities to stimulate competition and reduce the price. Dow Chemical has been the only post-war fabricator of magnesium sheet until recent weeks. Now several heavy-metal fabricating firms have begun experimenting with rolling magnesium sheet and one—Eastern Stainless Steel Corp. is turning out some quantity of sheet.

Munitions Board maneuvers to get Aluminum Co. of America to re-open its New Kensington, Pa., magnesium rolling mill have been unsuccessful. The plant has been partially dismantled and personnel absorbed by other Alcoa divisions. Alcoa's terms for opening the plant included amortization of special costs incidental to re-opening through the life of the military contract. Air Materiel Command thinks Alcoa's terms too high and nothing further has been done.

▶**Anti-Trust Threat**—Alcoa's high price plus possible anti-trust action by the attorney general if Alcoa got the job, has turned the military to seeking new sources of rolling facilities.

Air Materiel Command officials think they can squeak by for another six months and hope that the new producers will become effective by that time.

Congress Approves Record CAA Budget

Congress last week approved a record $206,548,605 budget for the Civil Aeronautics Administration for the 1950 fiscal year.

The Senate had recommended $207,048,605 (AVIATION WEEK, June 13); and the House, $197,873,605 (AVIATION WEEK, April 11). The compromise a victory for the higher Senate figure, is $56,737,106 over CAA's 1949 fiscal year budget.

▶**CAB Funds Up**—A 1950 fiscal year budget of $3,620,500 was approved for the Civil Aeronautics Board, slightly higher than the 1949 fiscal year allocation of $3,450,000. Budget Bureau had recommended $3,980,000 for CAB. The House approved the $3,620,500 finally agreed upon; the Senate had proposed $3,780,000.

Following are the final allocations for CAA activities for the coming year.

• **Establishment of air navigation facilities,** $45,450,000—$18,650,000 cash and $26,800,000 contract authorization. This is more than double last year's allocation of $22,440,499—$10,099,000 cash and $12,341,499 contract authorization.

• **Air navigation development,** $7,000,000—$3,000,000 cash and $4,000,000 contract authorization. Over the past year, the long-range all-weather-flying program was still in the planning stage and had an allocation of only $100,000.

• **Airport program,** $51,000,000—$14,500,000 cash and $36,500,000 contract authorization. This is substantially above the $40,000,000—$3,000,000 cash and $37,000,000 contract authorization —allowed for last year.

• **Alaska airports,** $5,800,000, for international ports at Fairbanks and Anchorage.

• **Washington National Airport,** $1,446,500—$1,250,000 for operation and maintenance and $196,500 for construction. Last year, the airport was allowed $1,185,000 for operations, or slightly less than this year, and $1,835,000 for construction improvements, now mostly completed.

• **Salaries and expenses,** $94,402,105. This is substantially above the $82,451,000 allowed for the 1949 fiscal year.

• **Technical development,** $1,450,000. This is slightly less than the $1,800,000 granted for this year.

IAS Awards

Institute of the Aeronautical Sciences presented the Octave Chanute award for 1949 to Navy Capt. Frederick M. Trapnell, and the Thurman H. Bane award for 1949 to Air Force Capt. Harold W. Robbins, at the IAS annual summer meeting in Los Angeles last week.

Capt. Trapnell, coordinator of tests at Patuxent Naval Air Test Center, was selected "for his contributions to flight testing of experimental aircraft with particular reference to operating requirements for carrier-based, jet-propelled airplanes."

Capt. Robbins, based at Wright-Patterson AFB, was cited as contributing "to the development of jet-assisted takeoff for cargo aircraft."

Stock Transactions Listed by SEC

Purchase of 500 shares of Eastern Air Lines common stock by Laurance Rockefeller, a director, making a total holding of 56,500 shares, is reported in the latest compilation of major transactions by the SEC.

Other transactions reported by SEC:

Air Associates, Inc. Sale of 800 common shares by Gilbert Colgate, New York City, director, leaving a holding of 13,648.

Alaska Airlines. Purchase of 100 common shares by James Wooten, Anchorage, president, making a total holding of 18,100.

Bell Aircraft Corp. Purchase of 3800 common shares by the First York Corp., New York City, making a total holding of 156,344.

Boeing Airplane Co. Purchase of 51 common shares by William Allen, Seattle, president, making a holding of 1551; purchase of 46 shares by Wellwood Beall, Seattle, vice president, making a holding of 299; purchase of 33 shares by Harold Bowman, Seattle, treasurer, making a holding of 408 shares; sale of 289 shares by Fred Collins, Seattle, vice president, leaving a holding of 311 shares; purchase of 46 shares by Fred Laudan, Seattle, vice president, making a holding of 665 shares; purchase of 33 shares by Edward Wells, Seattle, vice president, making a holding of 133 shares.

National Airlines. Purchase of 1600 common shares by Joseph Merrick Jones, New Orleans, director, making a total holding of 4000 shares.

Northrop Aircraft. Sale of 200 common shares by Richard Millar, Hawthorne, Calif., director, leaving a holding of 1100 shares.

Sperry Corp. Sale of 200 common shares by Thomas Doe, New York City, director, leaving a holding of 100 shares.

Square D Co. Purchase of 600 common shares by the C. M. Higbie Corp. (transacted by Carlton M. Higbie, Square D director), making a total holding of 900 shares.

Officers and directors reporting stock ownership to SEC were:

Curtiss-Wright Corp. Henry Hotchkiss, New York City, officer, no holdings; P. J. Murphy, New York City, officer, no holdings.

National Airlines. W. R. Grace and Co., holding of 174,000 common shares.

Warner Aircraft Corp. Leonard Quart, Detroit, officer and director, no holding.

Wright Aeronautical Corp. Henry Hotchkiss, New York City, officer, no holding; Joseph McCarthy, Wood-ridge, N. J., director, no holding; Paul V. Shields, New York City, director, no holding.

USAF Forms Tactical Air Force

Thunderjets assigned for support of ground forces, and Army and AF study use of other plane types.

U. S. Air Force moved this month to ease its strained relations with the Army over tactical air support of ground forces.

USAF action included:

• **Assignment of an improved version** of the Republic Thunderjet (F-84D and E) as a tactical air support plane.

• **Creation of a new Tactical Air Force** with headquarters at Pope Field, Ft. Bragg, N. C., for close co-operation with the Army in joint air-ground training maneuvers.

Lack of adequate air support planes and joint training facilities have been the two major points at issue between USAF and the Army. The controversy was also politically important since USAF has been winning major decisions over the Navy by a 2 to 1 vote of the JCS which saw USAF and Army chiefs of staff vote together against the Navy.

▶ **Army Unhappy**—Army has been unhappy over the situation since last fall when Tactical Air Command (then located close to Army Field Force headquarters at Langley Field, Va.) was relieved of its combat air groups and made a subordinate unit of the Continental Air Command. Lieut. Gen. Edwood (Pete) Quesada, TAC commander, was transferred to USAF headquarters. Quesada had been active in organizing joint training maneuvers with both Army and Navy and had sent TAC pilots to fly off Navy carriers in Atlantic fleet maneuvers.

In recent testimony before the Senate Appropriations Committee, Army Chief of Staff, Gen. Omar Bradley pointed out that the Marines enjoyed an air support of 21 squadrons for two ground divisions. Bradley said this was more air support than the army had ever had in World War II except on the Normandy beachhead. Bradley indicated that the Army had been putting steady pressure on USAF to increase its tactical air support elements during a series of conferences in the past several months. He said some progress had been made but there were still points of difference.

▶ **USAF Peddles Jets**—USAF has been interested in peddling its obsolescent jet fighter types as tactical air support planes while the Army is interested in a design competition for a new type ground support plane tailored specifically to its requirements. Tactical evaluations were also made of the Douglas Skyraider (AD) and Martin Mauler (AM) series, both Navy carrier-based attack planes packing a heavy armament of cannon, rockets and bombs. USAF rejected these types because of their lack of speed when compared with jet types.

Indications are now that USAF has at least partially sold the Army on the performance of jet fighters as ground support planes. Top Army brass has indicated they were surprised at the accuracy of dive-bombing and strafing by the Lockheed F-80 and Republic F-84 but they are still skeptical about these planes' ability to pick up pinpoint targets at speeds of over 500 mph. and their lack of range which restricts the time they can spend in a target area.

Next generation of possible ground support planes would include the McDonnell F-88, Lockheed F-90, both twin jet penetration fighters and the Martin XB-51 triple jet light bomber.

The new Tactical Air Force has no definite combat units assigned as yet. Its initial role will be to co-ordinate USAF-Army training maneuvers. It is likely that for initial ground-air training maneuvers it will get combat groups from Continental Air Command on temporary loan. USAF is also studying Army requirements for mass movement of ground troops by air over 3000-mile hauls.

Legislation Spurs Runway Lighting

Legislation to spur installation of high intensity lighting on runways by permitting the Civil Aeronautics Administration to use federal-aid airport funds for projects has been passed by the Senate and approved by the House Interstate and Foreign Commerce Committee.

The measure, sponsored by Sen. Pat McCarran (D., Nev.), would authorize CAA to assume the same share of lighting costs that it does of other costs (aside from land acquisitions). This amounts to 50 percent on small airports and "not to exceed 50 percent" on large class IV and V airports.

▶ **Other Bills**—Three other McCarran bills, designed to step up the lagging airport program, passed by the Senate and the House committee provided:

• **That the CAA can increase its obligation** by ten percent under contracts entered into with local sponsors for airport developments. At present, once CAA has set its maximum obligation for a development, the amount cannot be increased. McCarran pointed out that construction costs have risen considerably since some of the contracts were made.

• **That minimum wage rates must be specified** only on airport contracts in excess of $2000. This will eliminate considerable red tape for small contractors and CAA.

• **That state-allotted funds** may be used for airport developments in national parks, monuments, and on other federally-owned lands.

Another McCarran measure, authorizing CAA to make installment payments on airport projects, has been passed by the Senate, but not yet acted on by the House group. At present, payments are not made until a contract is completed. Sen. Edwin Johnson (D., Colo.), chairman of the Senate Interstate and Foreign Commerce Committee, estimates that installment payments would substantially cut down the cost of the airport program by removing the necessity for the present practice of contractors of including allocations for borrowing money in their bids.

▶ **Bills Lagging**—Action on three other measures urged by McCarran is not likely at this session. They would:

• **Authorize the CAA to finance** 50 percent of the cost of land for small airports and "not to exceed 50 percent" of the land cost on large class IV and V airports. At present, the federal share for land acquisitions is 25 percent for small projects and "not to exceed 25 percent" for big airports.

• **Boost CAA's "discretionary" fund** to 40 percent of each annual airport appropriation. It is now only 25 percent. Of each airport appropriation, 75 percent must be allotted to states on a population-area formula. McCarran has pointed out that several states have not used their allotments, but the money cannot be expended elsewhere.

• **Permit CAA to finance improvements** on big airports, up to $50,000, without submitting them to Congress for review. CAA is required to submit a list of all class IV and V projects by May 1 of each year so that Congress, if it sees fit, can veto funds for them for the following fiscal year, starting July 1.

Industry's Minimum Wage to Be Raised

The aircraft industry can look for a boost in the minimum wage applicable for all work on government contracts of more than $10,000.

The present minimum under the Walsh-Healey public contracts act, set in 1938, is 50 cents an hour. A broad hint that it might be raised to 95 cents is given in the Labor Department's announcement of hearings beginning July 26 in Washington. The announcement refers to findings of the Bureau of Labor Statistics that less than one-half of one

percent of the 165,000 employees in that part of the industry covered by the law earned less than 95 cents an hour last November. Almost three out of five workers received $1.40 or more an hour.

▶ **Textile Precedent**—Last fall the minimum in the textile industry was jumped from 40 to 87 cents an hour at the request of the CIO, although only 75 percent of the textile workers in the South were earning that much.

The hearing is the result of a request by the CIO United Automobile Workers that the minimum be raised. Representatives of the industry and unions may appear before an official of the wage-hour office, who will submit his findings to Secretary of Labor Maurice J. Tobin.

Secy. Tobin then will determine what the "prevailing minimum wage" is in the industry and make it applicable on government work. In the textile case, he granted the CIO's request for an 87-cent minimum in full. UAW-CIO did not specify a minimum figure in its application.

▶ **Define Industry**—The Labor Dept. also proposes to redefine the aircraft industry to make clear precisely what manufacturers are not included. The new definition would exclude, for instance, all lighter-than-air craft, fabricated textile products, pyrotechnics, electrical and communication equipment, rubber products, bolts, nuts, screws, etc., and engine, flight and navigation equipment. Aviation textile products comprises another industry with a minimum of 55 cents on the West Coast and 47½ cents elsewhere.

Included in the newly-defined industry is the manufacture of airplanes and gliders, aircraft engines, propellers, parts especially designed for aircraft and specialized servicing equipment.

UAW Plans Major Attack on Pay Scale

United Auto Workers (C.I.O.) union is planning a major aircraft campaign to raise pay in the industry to levels comparable with rates which are paid in other industries.

UAW claims that, classification by classification, aircraft wages are for the most part lower than in other fields.

To back up its claims, the auto union has prepared pay comparisons, by classification, with the automobile industry. It contends that these figures show that aircraft engine and frame builders do not pay their employes as much as auto makers do for the same jobs.

▶ **Seek Job Changes**—The UAW also is attacking the aircraft industry's job evaluation system. The union says that the sub-categories that exist within each classification are inequitable. Aircraft manufacturers, they claim, hold employes in lower categories, despite their increasing skill and experience. Therefore, says the auto union, these subgroupings should be eliminated.

The union hopes that it may be able to get government support for this aircraft program. The federal government, it asserts, is the industry's principal customer. For this reason, and also because of the policy of conciliation it established in the past, the government is expected to enter into aircraft labor disputes. As proof, UAW points to the recent Bendix strike, which saw the Air Force take part in the settlement.

▶ **Livingston Directs Drive**—This campaign is being developed under the direction of UAW vice president John W. Livingston, director of the union's national aircraft department and Paul M. Russo, assigned to the department as assistant director.

Livingston advanced to his vice presidency 18 months ago after several terms as a regional director for the southwest, headquartered at Kansas City. He says: "These aircraft plants are outstanding in the way they underpay their people. We're going to remedy that. The first thing we're going to do is get rid of S.C.A.I."

"S.C.A.I." is the Southern California Aircraft Industry plant, which includes three, sometimes only two, classifications of rates for particular jobs, based on evaluations of those jobs.

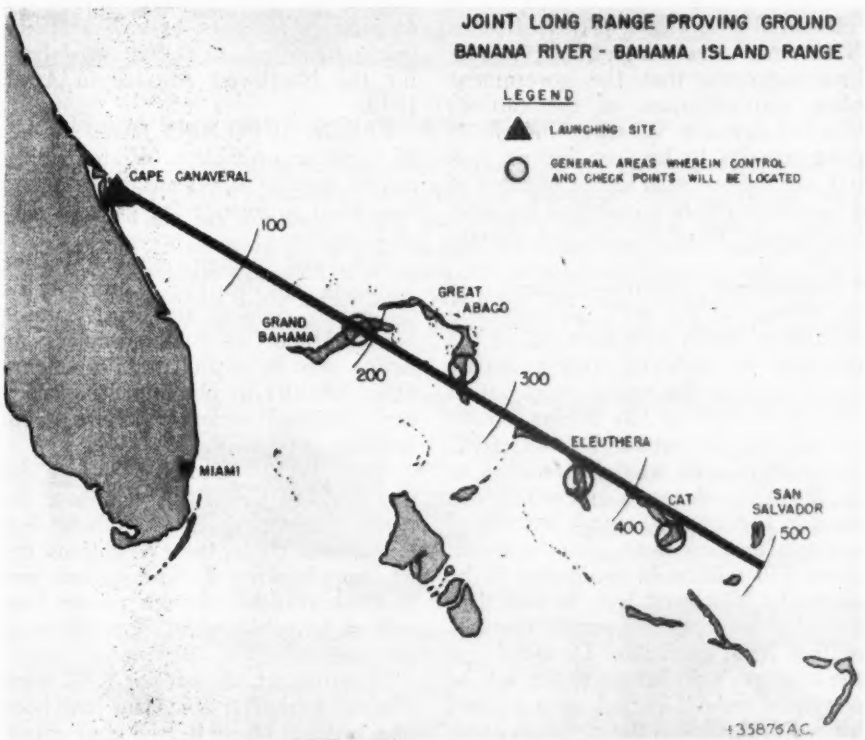
▶ **Rates Vary**—"Look at the rate in this plant," Russo said, pointing to one of the larger companies. "They pay a Class C tool inspector a spread from $1.25 to $1.35. And of course they, like the others, fix it so if a man works into a higher classifications they change the job and drop him back again.

That same tool inspector gets at least $1.82 in this group of automobile plants."

The strike at Bell Aircraft Corp., says Livingston, can properly be regarded as the starting of the campaign. UAW has contracts also at Douglas, Martin, North American, Fairchild, and Curtiss-Wright plants, so they can logically be expected to be UAW objectives as soon as contracts permit.

As Livingston sees it, the aircraft plant worker is a victim of double donations to the government at the expense of his living standard. First, he maintains, the employe gets a lower pay rate for working on production largely for the government.

Second, he pays taxes on that income. This line of thought leads to the position that the government should be a primary factor in the forthcoming contract negotiations.



NEW MISSILE RANGE

Schematic diagram of the new joint Army-Navy-Air Force guided missile test range to be located between Florida and the Bahamas Islands. Main base will be off the mouth of the Banana River in Florida with radar sighting and tracking stations located on Bahamian islands to provide a 500-mi. range for missiles. Authorization for the range has been approved by President Truman but no funds appropriated for it yet. Development of the range is planned as a five-year project.

FINANCIAL

What Airline Pays for Federal Aid

RFC requirements in Northwest financing show how carrier must sacrifice some managerial discretion.

The role of the Reconstruction Finance Corp. in airline affairs is currently being highlighted by its proposed participation in the financing of Northwest Airlines.

Contrary to some reports, RFC is not advancing a loan to the carrier but is merely guaranteeing the bankers against loss, to the extent of $12 million out of a total $21 million commitment.

This marks the first instance on record where the RFC has used this approach in making funds available to an airline. In the past, RFC help to air carriers was on a direct basis.

► **$3 Million**—This proposed RFC guarantee for Northwest does not involve $12 in new financing. In reality, only $3 million in additional capital is being made available to the carrier over and above the amount anticipated more than two years ago.

In January, 1947, Northwest projected an expansion program entailing capital expenditures of some $39,552,000. This was to be financed partly in new funds to be supplied through the sale of more than $9 million in preference shares and $18 million in bank loans.

The bank loans were specifically designed to be drawn down to pay for new flight equipment and originally served as a revolving credit. On Apr. 30, 1949, the entire amount was scheduled to be funded on a five-year basis, payable in equal quarterly installments. However, a most interesting provision specified that if the Boeing Stratocruisers were not delivered by Apr. 30, 1949, the banks could withdraw from this funding agreement.

► **Credit Cut**—With the delay in the Boeing delivery schedule as an excuse, but probably more concerned with the deteriorating finances of Northwest, the banks did not choose to fund this full credit, having kept the loans down to $9 million.

Originally, it was proposed that Northwest pay 2½ percent interest on the $18 million funded debt. It now appears that the banks will obtain 4 percent on the $9 million already advanced and about 3¾ percent net on the $12 million they will advance under RFC guarantee. The government agency will receive about ¾ of 1 percent for its guarantee.

The Northwest situation, interestingly enough, presents the curious paradox of traditionally outspoken advocates of private enterprise apprehensive of shouldering the risks involved and seeking refuge under the umbrella of a government guarantee.

► **Government Dependency** — Northwest's principal underwriter, Auchincloss, Parker and Redpath, who engineered the 1947 capital moves, evidently couldn't arrange necessary financing at this time. Significantly, in the Apr. 30, 1947, financing, the underwriters received total commissions and discounts aggregating $663,000. The preferred stock purchased by the public, on the other hand, now shows a market loss of more than $3,500,000 since their issuance.

The very nature of the current RFC loan guarantee provision has created considerable controversy. In view of the substantial government participation in Northwest, some congressional sources have suggested that the government place representatives on the carrier's board of directors. Whether this will be done remains to be seen but it does indicate the potential loss of freedom of action by any enterprise which becomes increasingly beholden to the government.

► **Government Controls**—Certainly, in the absence of this RFC participation, Northwest would have been spared the necessity of justifying before Senate committees its managerial judgment in ordering a fleet of ten Boeing Stratocruisers for its service. Further, RFC has insisted upon what it considers to be adequate safeguards and which can serve to restrict the carrier's latitude of managerial movement. For instance, about $30 million in equipment to be owned by Northwest is to be placed in a chattel mortgage to secure the $12 million RFC guarantee. Dividends on the company's preference shares will be permitted only if earned on a current basis. Dividends on the common stock presumably can be paid only with the consent of RFC.

RFC loans to the airlines at the present time are far more complicated than they were when first utilized about 14 years ago.

► **Times Change**—Back in 1936, American Airlines sought bank credit to finance a fleet of new DC-3s. The banks refused on the ground that aviation was too risky. At this point, RFC stepped in and made total loans of $1,236,000 at 5 percent to finance the initial purchase of 20 DC-3s costing $2,060,000. The company's equity was 40 percent at the outset with provision made for the amortization of the loan on a monthly basis over a five-year period. During 1937, an additional $618,000 was borrowed to finance 10 more DC-3s valued at $1,031,000 on virtually the same terms.

► **CAB's Role**—In mid-1947, Congress amended the RFC act pertaining to airline loans with the requirement that the Civil Aeronautics Board must state that the borrowing airline "on the basis of present and prospective earnings, may be expected to meet its fixed charges without a reduction thereof through judicial reorganization."

This requirement has been the center of much conjecture in airline financial circles. A number of sources indicate that this stipulation attached by CAB to an RFC loan virtually assures the carrier involved of sufficient mail pay to survive and pay its debts. On the other hand, a CAB member testified that no CAB guarantee as to mail pay was implied in these RFC stipulations.

RFC loaned Western Air Lines $3.8 million in December, 1947. This represented the first financing under the amended procedures, as well as being the first government airline loan following the Northwest advance in April, 1939.

In July, 1948, RFC made another $2.3 million available to Western. Both credits were at 4 percent interest and were used to finance the carrier's fleet of Convairs.

The basic criterion in sound airline financing remains the ability of the carrier to develop sustained earning power. Under such circumstances, an airline may be expected to experience little difficulty in obtaining the necessary financial accommodations from banking sources.

With such a favorable outlook for earnings, the lender can anticipate the regular amortization of outstanding obligations. Under these conditions, the necessary banking accommodations generally are available through private channels at favorable terms, thus obviating the need of RFC assistance.

In retrospect, all previous RFC loans made to a number of airlines have been on a prudent basis. By the same token, these obligations have been well secured and, more or less, have circumscribed the freedom of managerial movement on the part of the airlines involved. In an hour of need, a government loan may be most welcomed, but a relatively high price is paid as well.

—Selig Altschul

A page of service tips for private flyers and fixed-base operators

PLANE FAX

Check the weather—file a flight plan

Wise pilots take the guess-work out of cross-country flights by checking the latest weather reports before revving up. And they make sure others know where they're going, too. It's wise to play safe—to check the weather and file a flight plan with CAA Communications Center.

Cross-Country Tips

Inspect your plane before take-off

Be sure to make a pre-flight check before every cross-country . . . gas, oil, tires, battery, spark plugs leads, struts and control surfaces. Your Standard Airport Dealer will be glad to give your plane a complete going-over at the required intervals. He's had factory-trained experience to keep all parts of your aircraft in tip-top shape. So let him go to work for you. He'll take better care of your plane.

Figure your gas consumption—accurately

Good rule for computing fuel needs is: Enough gas to reach your destination and alternate airport, plus 45 minutes extra. And for maximum cruising range, use Chevron Aviation Gasoline. Ordinary fuels may contain too high a ratio of light fractions which can cause rapid consumption and an empty gas tank. But premium-quality Chevron Aviation Gasoline is scientifically blended for even consumption and fuel economy under all flight conditions. You'll get the most out of your plane—in flying hours and peak performance—with high-octane Chevron Aviation Gasoline.

Fuel supply rule-of-thumb

Have enough gas for destination
+
alternate field
+
45 minutes flying supply

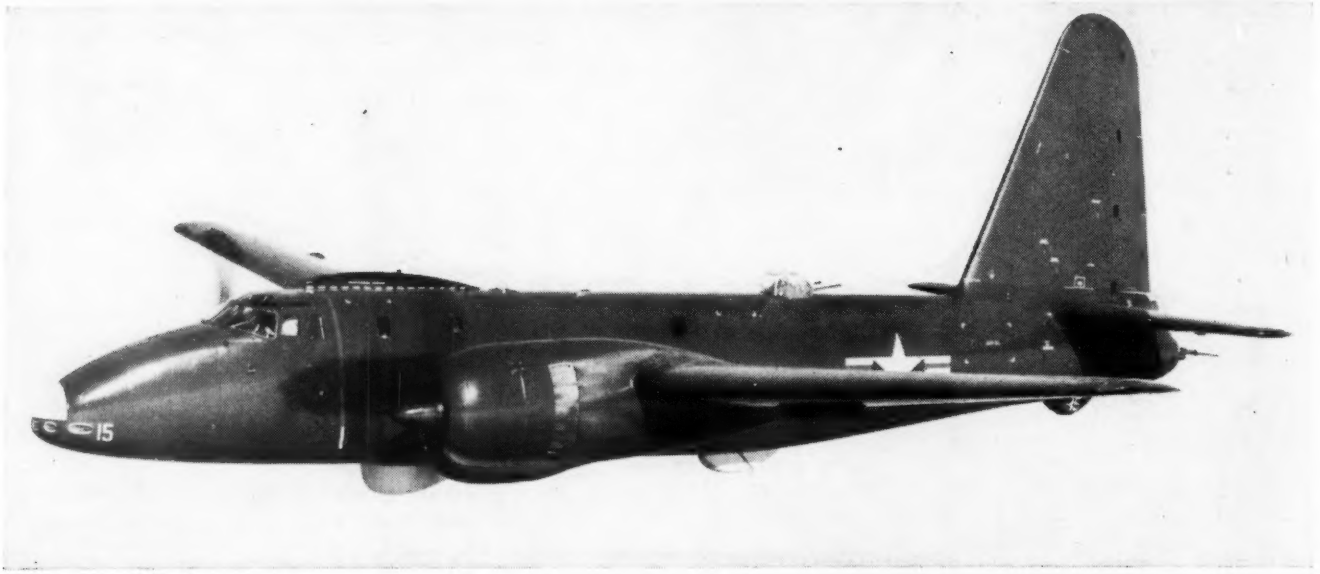
"Call in" your position—keep air-ground contact

Maintain contact with Airways Communications Stations. Your flight calculator tells when you are approaching each check point. Simply turn the dial once for your answer to any time-and-distance problem. If you haven't picked up your free calculator from your Standard Airport Dealer, why not do it right away.

CHEVRON AVIATION GASOLINE

RPM AVIATION OIL

Standard Oil Company of California



PRODUCTION MODEL of P2V. Ice-catching "bumps" under fuselage were one improvement resulting from extensive flight tests.

Design Analysis

How P2V Meets Patrol Objectives

Lockheed Neptune fulfilled requirements through new design and production techniques and after thorough testing and modification.

By John B. Wassall*

In the early stages of World War II the U. S. Navy used the Lockheed PV-1 (Ventura) in quantity as a land-based patrol plane for anti-submarine and anti-surface vessel patrol and attack. Inasmuch as the PV-1 was the first high-speed land-based patrol airplane used by the Navy, and realizing that its aerodynamic configuration grew out of the commercial Lockheed Lodestar, its tactical utility was a compromise.

After the PV-1 had seen considerable tactical service, and while an improved version, the PV-2 (Harpoon), was being developed, it became apparent to BuAer and Lockheed personnel that tactical requirements of a patrol airplane could never be fully satisfied "off-the-shelf". Only by developing an airplane specifically designed for the primary mission of day and night anti-submarine and anti-surface vessel patrol work, could this need be filled.

Secondary missions, in order of importance, were specified as rocket attack, night torpedo attack, mine laying, mast level bombing, horizontal bombing, and photograph reconnaissance. The ability to carry out secondary missions was considered to be that available after providing the best possible facilities for the primary mission. The smallest land-based airplane with the required long range dictated the basic concept of what evolved as the P2V Neptune.

▶ **Objective**—The present P2V configuration resulted from study of several different size airplanes. The primary development objective was to increase the probability of patrol target detection and to increase the offensive power against such targets. These requirements call for long range, short take-off and easy maintenance.

The P2V, carrying a seven-man crew, has a top speed of 300 mph., 5000-mi. range and ability to stay aloft at least 36 hr.

▶ **Easy Disassembly**—The fuselage, designed for easy disassembly, consists of six sections bolted together. Plumbing and ducting have disconnect fittings at break points. The wing is intended to give temporary flotation in the event of ditching and can carry 16 rocket launchers on the lower surface. Heated leading edge de-icing is provided.

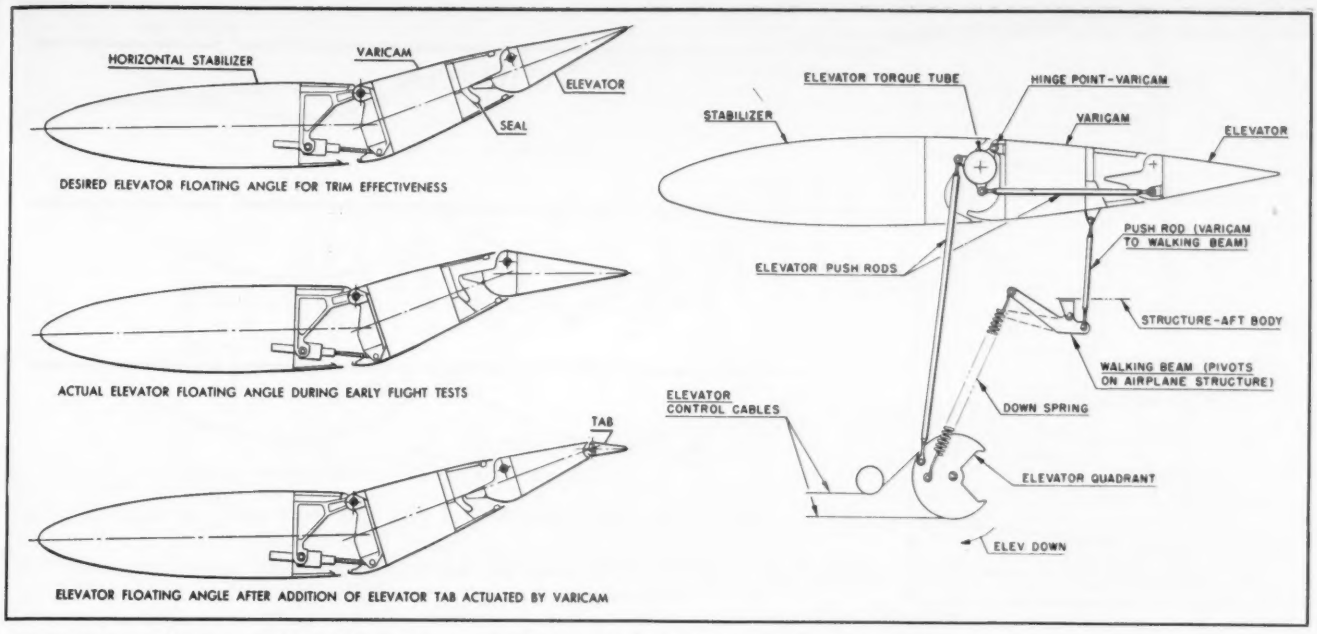
"Varicam" (variable camber), the aerodynamic characteristics of which will be discussed later, is a feature of the elevator and is operated by an electrically driven irreversible screw and nut assembly. Empennage control surfaces are mounted with anti-friction bearings. The detachable leading edges of the stabilizer and fin are de-iced thermally.

Accessories are reached through large doors on the firewall in the landing gear wells, while four removable panels on each cowl give access to the engines. A wide range of temperature control is obtained by varying the cooling air inlet area by means of a controllable nose flap assembly.

▶ **Fuel System**—Each engine receives its fuel from separate systems interconnected by a cross-feed line controlled from a panel in the floor of the cockpit. Self-sealing tanks are installed in the wings and the four droppable bomb bay tanks are interconnected, though they may be installed separately if desired.

Bolted stressed skin panels provide clearance for removal of the inboard tanks, whereas the outboard tanks may

* Chief production development engineer, Lockheed Aircraft Corp. Excerpts from paper delivered before summer meeting of the Institute of the Aeronautical Sciences, Los Angeles, July 21, 22, 1949.



VARICAM as installed on P2V (right) and result of addition of tab (left) made after wind tunnel tests described on page 25.

be removed by detaching both the leading edge and web plates in the front spar.

During design development, much consideration was given to service and maintenance features. Result is that an engine, including mount, accessories, etc., can be removed and replaced in 30 minutes, a propeller in 22 minutes and an outer wing in 79 minutes.

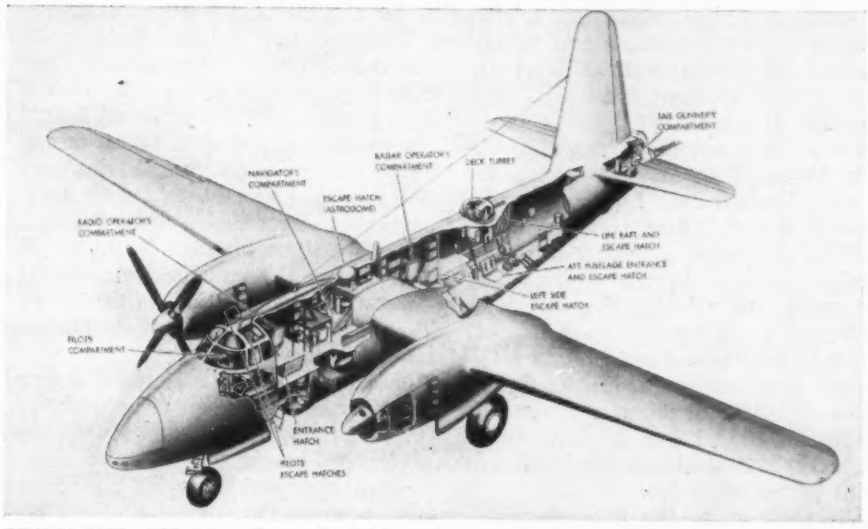
▶ **Producibility**—Design producibility was an important consideration. The major portion of the fuselage contour is curved in only one direction, permitting use of unformed skins.

The center wing section and mid-section of the fuselage, including the critical bomb bay door area, are of constant cross section, permitting multiple use of many parts and assemblies and eliminating expensive forming and wasteful splices in major load carrying members. The intersection of the wing and fuselage is left unfilleted.

The component breakdown of this model was carefully calculated to give the maximum of jig and assembly access with a minimum of mating and final assembly labor. Particular attention was paid to the flight station, a production bottleneck on most airplanes.

Every major joint on the P2V is a single plane tension joint, with oversize holes to facilitate assembly and mating operations. The fillets at the fuselage-empennage intersection do not extend outboard of the joints, thereby eliminating attachments to the surfaces.

▶ **Economy Record**—Such preliminary design considerations as these, carefully followed through in the detail design and tool design phases, have permitted the Lockheed Aircraft Corp. to set an economy record with this model of which the industry may be proud.



CUTAWAY of Neptune shows disposition of crew complement and interior arrangement.

The basic aerodynamic characteristics required to provide maximum tactical utility for the Neptune, in order of importance, are:

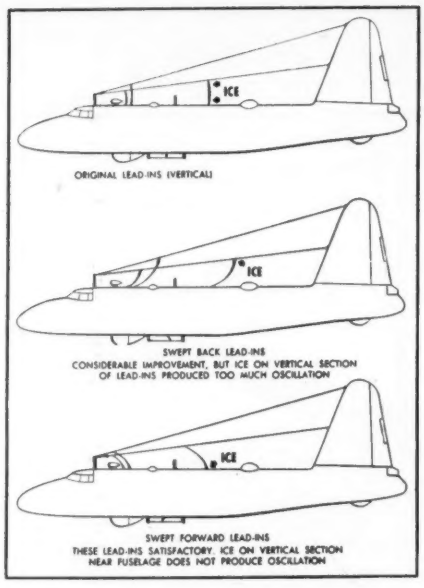
- **Long range** (to patrol as large an area as possible).
- **High speed** (for closing and defense; also to patrol the designated area in a minimum amount of time).
- **Ability to take off** and land in small fields.
- **Good flying qualities** to reduce crew fatigue.
- **Maximum single engine** and operative altitude.

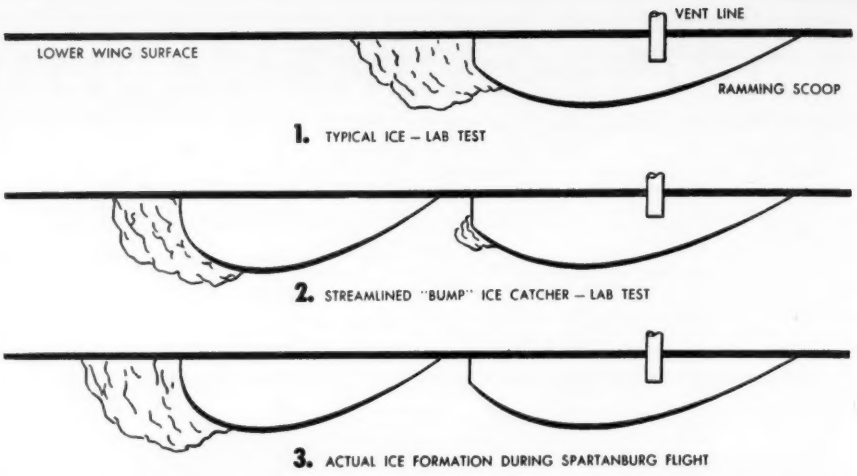
Since range is of primary importance, wing shape and area were selected first, to satisfy this requirement and, second, for single-engine flight at a gross weight of 58,000 lb. The area of 1000 sq. ft. was determined by landing requirements. Since the optimum aspect ratio was near 10, the span was made an even 100 ft.

▶ **Airfoil Selection**—At the outset it became apparent that some form of low drag airfoil was desirable to obtain a high critical Mach number for future power increases and possibly to lower the drag. The NACA laminar flow airfoils available at that time were considered inadequate because of sensitivity to surface roughness caused by current production and service practices.

For this reason, a study was made to determine how to reduce the drag of well-known standard NACA airfoils. The 2419 section was thus modified by moving the maximum thickness of the basic section aft from 30 percent to 38 percent chord position.

To provide good stall progression as well as high maximum lift coefficients only a small amount of leading edge sweep was used. The 15 percent chord was kept straight. Further to aid this desired characteristic a small amount of taper (0.5) was used in conjunction


ICE
ORIGINAL LEAD-INS (VERTICAL)
ICE
SWEPT BACK LEAD-INS
CONSIDERABLE IMPROVEMENT, BUT ICE ON VERTICAL SECTION OF LEAD-INS PRODUCED TOO MUCH OSCILLATION
ICE
SWEPT FORWARD LEAD-INS
THESE LEAD-INS SATISFACTORY. ICE ON VERTICAL SECTION NEAR FUSELAGE DOES NOT PRODUCE OSCILLATION


VENT LINE
LOWER WING SURFACE
RAMMING SCOOP
1. TYPICAL ICE – LAB TEST
2. STREAMLINED "BUMP" ICE CATCHER – LAB TEST
3. ACTUAL ICE FORMATION DURING SPARTANBURG FLIGHT

ICE-CATCHER (above) installed ahead of fuel tank vent scoop to avoid clogging.

ANTENNA LEAD-INS (left) tested for best arrangement under severe icing conditions.

with a 4410.5 tip section and 1.5 deg. of aerodynamic washout.

Actual flight has proved that aileron control is always available and no uncontrollable tendency to fall off on one wing is apparent even with large amounts of power.

▶ **Flaps**—Since one objective was to obtain low stall speeds and stretch for future development, Lockheed-Fowler flaps were used. These flaps were modified to minimize manufacturing and design problems by use of a circular arc track and reducing the maximum deflection to 32 deg.

From wind tunnel tests, it was determined the maximum lift coefficient suffered little if at all, as a section lift coefficient of 3.3 was attained. Complete airplane maximum lift coefficient with power off is 2.6.

In addition to the flaps described, ailerons were drooped 10 deg. Besides a higher maximum lift coefficient, a better span loading was realized for the flap-down condition. No difficulty has been experienced with this feature.

▶ **Flying Qualities**—Inasmuch as pilots are required to fly this airplane on very long missions, under adverse weather conditions and usually at low altitude, it was important that as little pilot effort as possible be required to fly under such conditions. Therefore, an effort was made to design the airplane to satisfy the desires of the many pilots with whom this subject was discussed.

For low single-engine control speed, a large vertical tail (18 percent of wing area) was incorporated. This produced approximately twice the directional stability normally found on contemporary airplanes.

With such a large fin there was fear of spiral instability. Through studies, however, indicated this would not be a problem. In addition to obtaining good low-speed, single-engine control, the increased directional stability is desirable for slow-speed approaches as well as for a good bombing platform.

Evidence that the good flying qualities of the P2V were the result of thorough engineering work is apparent when it is pointed out that the wind tunnel test reports record data taken during 5471 runs in wind tunnels at Ames Aeronautical Laboratory; Langley Aeronautical Laboratory; Wright Brothers Tunnel, Massachusetts Institute of Technology; Guggenheim Aeronautical Laboratory, California Institute of Technology; and Lockheed Aeronautical Laboratory.

▶ **Horizontal Tail**—Horizontal tail area is usually determined by either stability considerations, or control at low speeds to obtain maximum lift coefficient. Since a high maximum lift coefficient was required, the control problem became important.

A large tail would have been necessary if conventional means were used. This tail would provide an excessive amount of static stability with power off, and probably no more stability with power on owing to the larger power effects. Further, a large drag increment would have resulted.

▶ **Varicam** – Another approach was made to the problem. That was to design the smallest tail possible by using the most effective means of obtaining high tail lift. This led to use of the "varicam".

The varicam is a movable surface between the stabilizer and elevator which changes the camber of the surface. The advantages were found to be large maximum tail lift coefficient, a smaller tail, less power-on effects, large center of gravity range, and a tail area that could be designed for stability instead of landing control.

In addition, the varicam made it possible to use a narrow chord elevator which reduced the problem of obtaining satisfactory control forces.

An adjustable stabilizer was not used because the effect of tail turret on fuselage shape made the fairing problem very difficult. Fuselage gaps involved became untenable.

The effectiveness of the varicam was found to be almost as great as moving the stabilizer. Thus, fuselage cutouts would be considerably smaller. Another difficulty involved in the design of an adjustable stabilizer was the problem of hinging and moving such large surfaces.

▶ **Structural Development**—In order to realize high structural efficiency, the arrangement of the wing was laid out to eliminate all possible cutouts, discontinuities, and eccentricities. This included balancing the airplane in a manner that allowed the main landing gear to retract forward into the engine nacelle, without requiring a cutout in the primary wing box.

The wing box was carried continuously through the fuselage. This served another incidental advantage of mounting the entire bomb bay load directly to the wing box which provided airload support for this large dead weight item in the most direct load path, reducing fuselage shell material other arrangements would require.

▶ **Control Surfaces**—In the extensive program of flight testing undertaken on the P2V Neptune, many problems were encountered. A few of the more interesting are described here.

In order to obtain the largest control effectiveness for a given amount of pilot effort, internal aerodynamic balances and balance scales were used for all control surfaces. It was expected, at the outset, that considerable attention would have to be paid to the hinge moment characteristics of the control surfaces.

The philosophy followed in develop-

BENDIX-SCINTILLA

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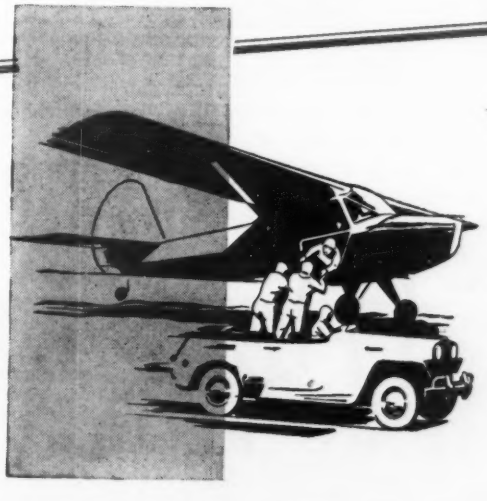
THE history of aviation has been highlighted by a never ending series of outstanding accomplishments. Whenever a plane flies faster, farther, or more safely than ever before, its record-breaking performance is accepted only as a challenge to even greater achievement. The words "status quo" have never been part of aviation's nomenclature.

Bendix-Scintilla has, over the years, kept pace with aviation's progress by meeting both today's demands and tomorrow's requirements for the finest in ignition equipment. That's why from the industry's earliest days, Bendix-Scintilla ignition equipment has played a part in *almost every record-breaking accomplishment.*



Bendix-Scintilla
Helps Set New Endurance Record

Over 1,000 hours aloft—more distance than three times around the world—that's the new endurance record set by Dick Riedel and Bill Barris. Flying an Aeronca plane, powered by a Continental engine, and sparked by two Bendix-Scintilla Magnetos, this new record-breaking performance was completed on April 15 at Fullerton, California. Congratulations to these two outstanding pilots!

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ing the control surfaces was to incorporate neutral balance into the initial design, then during early flight tests to adjust hinge moments in order to obtain the desired "feel," by utilizing extended trailing edges and anti-balance tabs which could be easily changed during flight testing.

This plan guaranteed that sufficient balance would be available, and insured against the possibility of having to make delaying production changes such as adjusting length of balance along with the relocation of rear spar. This was done on all surfaces owing to the small amount of time available between prototype test flights and scheduled delivery of production airplanes.

► **Elevators**—Early in the wind tunnel test program, it was found that the effectiveness of the varicam as a trim device was reduced because the elevator did not trail as an extension of the varicam. Rather, it acted as an independent surface. For this reason, a second tab mechanism was devised and installed on the other elevator so that down tab is provided when the varicam is moved up for nose up trim.

The shape of cover plate over sealed balance cavities is very critical with respect to elevator trail angle. Due to small variations in shape of balance cavity cover plates on a few early production airplanes, the elevators had a tendency to trail in a down position and as a result an undesirable trim condition existed. Furthermore, there was too much difference between airplanes. To remedy this condition, the top surface balance cavity cover was pulled down below contour.

This caused an increased pressure by forming an expansion or damming effect at the slot between cover plate and elevator leading edge, producing higher pressure on top of the balance blade. The elevator trailed higher at all times, relieving the trim difficulty. This was found to be easy to reproduce in production and eliminated the complaints about variations in trim characteristics between airplanes.

► **Elevator Downspring**—Associated with airplane growth is the need for wider C.G. limits—usually rearward. This was recognized in the early stages of flight testing on the P2V. A downspring (bungee) was tested which extended the aft limit from 32 percent to 38 percent M.A.C. (useful C.G. limit from 18 percent to 38 percent.) However, like all bungees, this adversely affected the landing stick force at forward C.G.

Since the maximum up varicam deflection is used only for forward C.G. landing, the logical solution was to modify the downspring action so that it became inactive at large trim settings.

This type of motion can be carried even further by making the downspring become an upspring to reduce the landing stick forces at forward C.G. Because the P2V landing stick forces were not excessive at forward C.G. with the downspring inactivated, and the apparent complexity of a double spring arrangement, this refinement was not made.

► **Ailerons**—On the first airplane, aileron characteristics, with flaps up, were reasonably satisfactory. However, when flaps were lowered and ailerons drooped, lateral trim changed noticeably and aileron control forces became much heavier. To make matters worse, the trim tab, when fully deflected, was not effective enough to restore the aileron trim.

Many tests were conducted in an effort to correct this condition. It was learned that the section of leading edge balance at the inboard end of each aileron had reached the end of its effective angular range when the ailerons were fully drooped (flaps down). With such a condition existing, a trim change was certain to occur between flaps up and flaps down.

The cure was to remove a short length of aileron balance seal from the inboard end of each aileron and provide in its place as aerodynamic balance the greatest possible amount of balance action for the tab on each aileron.

► **Rudder**—During early flights, a spring tab was used on the rudder. A spring tab provides balance action in proportion to the force applied to the rudder

Summary of P2V Performance . . .

	UNITS	P2V-1	P2V-2	P2V-3
WEIGHTS				
Take-off gross weight	lbs.	61,153	63,078	64,100
Weight Empty	lbs.	33,720	33,962	34,875
Useful Load	lbs.	27,433	29,116	29,225
Combat weight	lbs.	47,115	49,040	50,062
Landing weight	lbs.	54,000	54,000	54,000
PERFORMANCE	at COMBAT WEIGHT and COMBAT POWER (1)			
Maximum speed at altitude	knts./ft.	263/15,300	278/13,500	294/13,000
Service ceiling (R/C = 100 ft./min.	ft.	27,000	26,000	28,000
PERFORMANCE	at TAKE-OFF WEIGHT and TAKE-OFF POWER			
Take-off distance—S. L. calm	ft.	2,390	2,340	2,200
To clear 50 ft.—S. L. calm	ft.	4,260	4,280	4,140
PERFORMANCE	at TAKE-OFF WEIGHT and NORMAL POWER			
Rate of climb, S. L.	ft./min.	1,050	810	1,060
PERFORMANCE	at LANDING WEIGHT			
Stalling speed—power on	knots	67	67	67
Landing distance over 50 ft.	ft.	3,560	3,560	3,560
RANGE @ 1,500 ft. using MAXIMUM RANGE POWERS with allowances for (2)				
Range	Naut. Miles	3,590	3,460	3,420
Average speed	knots	153	155	156
Fuel Used	gallons	3,350	3,350	3,350
Take-off wt.	lbs.	60,731	62,656	63,678

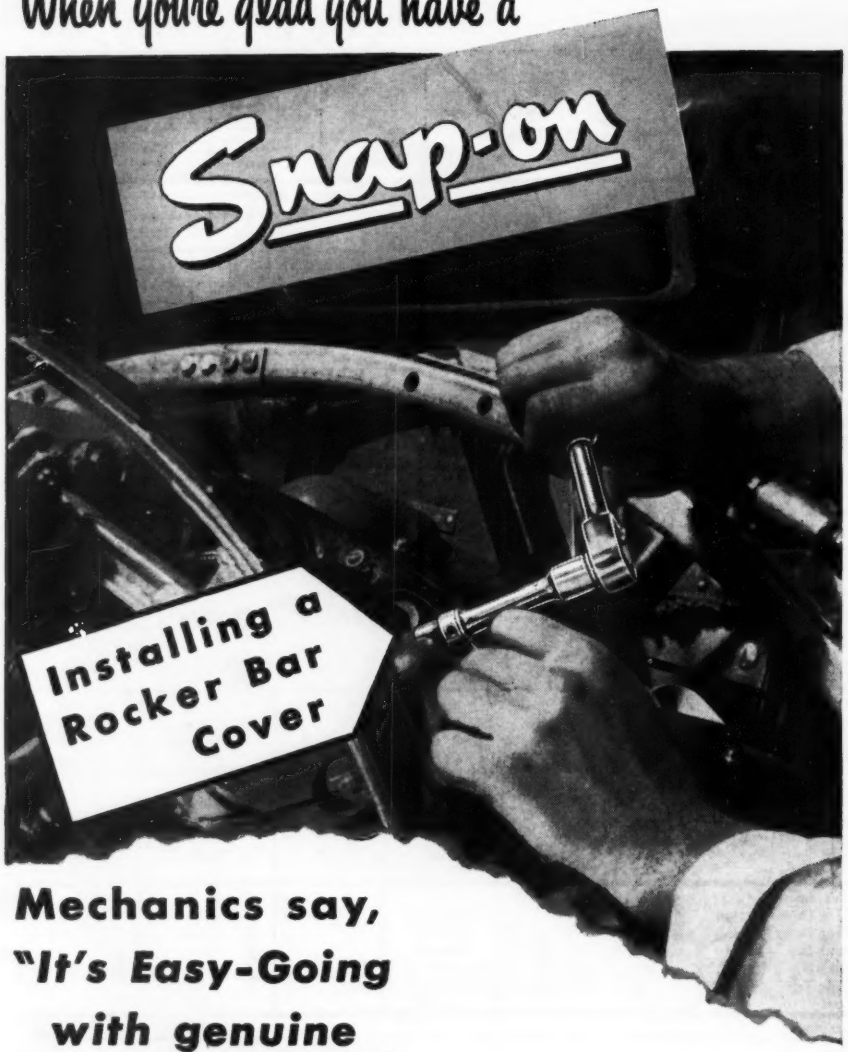
(1) Except P2V-1 which is at *military* power.
(2) 5% increase in S.F.C., run-up and climb, and 10% reserve.

. . . and Characteristics

	UNITS	P2V-1	P2V-2	P2V-3
ENGINES, R-3350		-8	-24W	-26W
Combat Power (Wet)	BHP/ENG.		2,800	3,200
Military or Take-off Power (Dry)	BHP/ENG.	2,300	2,500	2,700
Normal Rated Power	BHP/ENG.	2,100	2,100	2,300
Design Gross Weight	Pounds	45,000	54,000	54,000
Max. Take-off Gross Weight (a)	Pounds	61,153	63,078	64,100
Combat Weight	Pounds	47,115	49,040	50,062
Max. Landing Gross Weight (a)	Pounds	54,000	54,000	54,000
Weight, Empty	Pounds	33,720	33,962	34,875
Useful Load	Pounds	27,433	29,116	29,225
Fuel Capacity				
Wing Center Section	Gallons		1,400	
Wing Outer Panel	Gallons		950	
Bomb Bay	Gallons		1,000	
Fuselage	Gallons		0	
Wing Tip	Gallons		0	
Total	Gallons		3,350	
Armament				
Nose		2—.50 cal. flex.		Six 20 mm. Fixed
Deck Turret		2—.50 Cal.		
Tail Turret		2—.50 Cal.		2—20 mm.
Sonobuoy Installation		No		Yes
Hot Wing and Tail		No		Yes
APS 20 Radar		No		
Wing Tip Searchlight		No		
Provisions for Compound Engines		No		

(a) These are gross weights for certain specified naval loadings. A P2V-1 airplane has successfully taken off at 85,000 lbs. (with JATO) and landings at 58,400 lbs. are commonly made.

When you're glad you have a



Mechanics say, "It's Easy-Going with genuine Snap-on Tools"

HARD-TO-GET-AT nuts and bolts, so common in aircraft maintenance, are easy-come, easy-go for the mechanic using Snap-on tools. Whether it's tightening down a rocker bar cover . . . or performing any other nut-turning operation, there's a Snap-on wrench to do the job easier and faster. Snap-on's are quickly adaptable to a variety of operations by simply interchanging handles, sockets, and other attachments.

Because Snap-on tools are precision built and carefully engineered for maximum efficiency, they stand out as the number one choice of aviation mechanics everywhere. Snap-on's tool service is available through 40 factory branches and almost 800 trained Snap-on men in the U. S. A. and Canada.

SNAP-ON TOOLS CORPORATION
8020-G 28th Avenue
Kenosha, Wisconsin

pedal. This was installed to keep rudder control forces at a low value for low-speed single-engine operation.

At one point propeller vibration stress surveys were being conducted, and one test called for as much yaw as possible at a high level flight speed. To obtain the desired yaw, a 300-lb. rudder pedal force was applied at approximately 255 mph. indicated air speed. Immediately a loud noise was heard, followed by a lurching increase in yaw. From then on the flight consisted of efforts to land the airplane safely.

After landing it was discovered that the leading edge was off the vertical fin, the right bomb door was missing and the rear part of the fuselage was so badly twisted that a number of frames had failed.

► **Cause**—This is what happened: By applying a 300-lb. pedal force, the rudder angle obtainable with a spring tab was large enough to produce more yaw and aerodynamic load than the structure was designed to carry. With the leading edge off the fin, the yaw increased faster than the reaction of the pilot and the resulting side load tore off one of the bomb bay doors.

In a steady yaw condition such as this, very high peak pressures exist on the fin leading edge in a direction opposite to the air load on the rudder. A factor worthy of note was the deflection of the open "D" shape leading edge which changed the airfoil shape sufficiently to result in an appreciable increase in the aerodynamic load.

Further tests were conducted with no spring tab action on the rudder tab, and with greatly increased strength in the leading edge and rear section of the fuselage. Single-engine control was found to be satisfactory with this configuration.

► **Icing Tests**—Flight tests to determine the effectiveness of the heat anti-icing system involved approximately 100 hours of flying. Types of icing conditions encountered varied from light rime to moderately heavy clear ice. The program included ascertaining that power plant, propeller, radio, and other components would function satisfactorily in icing conditions.

Precipitation static under certain atmospheric conditions using bare wire antennas was found to make the radio practically useless with exception of VHF communication. Substantially improved radio operation was realized after polyethylene coated wire antennas were installed.

During the first flight in icing conditions, the vertical antenna lead-ins were carried away due to severe oscillations developed with ice on the lead-ins.

This problem was solved by sloping the lead-ins forward. It is impossible to

keep the lead-ins taut enough to prevent the sag which makes a short section nearly perpendicular to the flight path.

► **Two Hours**—Of particular interest is one flight in the Spartanburg, S. C. area where the airplane was flown in icing conditions for two hours. It was a freezing rain, temperature 30 deg. F., and dew point 29.

Unfortunately, the icing level was at such a low altitude that it did not allow a comfortable ground clearance. The worst icing level was at 1000 ft. above the ground.

Upon encountering the icing level the windshield iced over immediately with a thin coating of clear ice. Smooth glaze ice started forming on nacelles and other unheated parts of the airplane. Flight was continued at constant altitude and constant indicated airspeed of 160 mph. up and down the Spartanburg radio range within a radius of 20 miles from Spartanburg.

As the flight continued, water was observed running back from the wing leading edge and freezing in streams. This occurred from a point several feet beyond the nacelle to a point about 70 percent of the semi-span. Beyond that point the wing remained clear and dry. No ice formed on the leading edge of either the wing or tail.

► **Ice Catchers**—Previous to this flight a research program was conducted in the Lockheed Research Laboratory to develop suitable protection for the fuel tank vents so that under normal conditions ram pressure would be supplied to the fuel tanks, and under icing conditions even though the ram pressure might be reduced it would not fall below acceptable limits—considered to be approximately minus 3 in. of water. This resulted in "ice catching bumps" being installed ahead of all tank vent scoops.

As ice built up during the Spartanburg flight, it was noticed that the fuel tank ram pressure dropped off. It reduced rapidly at first, and then seemed to stabilize out. This was expected, because wind tunnel tests had indicated that a small amount of ice would spoil the flow over the ice catching bump and destroy a large part of the tank ram.

However, the stalled condition would quickly approach a peak, after which a great amount of ice would be required to lose all the ram pressure or make it negative.

General comments on the flight were: There was no frozen runback on the stabilizer. Icing and vertical fin frozen runback were similar. No effect on lateral or longitudinal control was noticed. Due to presence of frozen runback on the vertical fin, a small amount of rudder buffeting was detected, and a

ADEL

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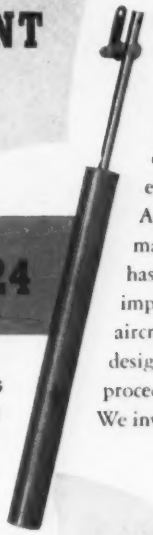
Adel has unsurpassed facilities for the design, engineering and manufacture of a wide variety of aircraft equipment. Typical examples are shown here. Adel engineering and manufacturing versatility has brought about constant improvements in various types of aircraft products. Assistance in design problems is standard procedure offered at Adel. We invite your inquiry.

#17524



SELF-ADJUSTING CYLINDER WITH AUTOMATIC RETURN

A unique self-contained hydraulic lock cylinder with an automatic return employed for reclining adjustment of air liner seats. Cylinder is positively locked in position when passenger is seated but automatically returns seat to vertical position in three to ten minutes after it is vacated.

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MECHANICAL DISENGAGING MECHANISM

A positive acting safety device for manual disengagement of engine driven accessories in case of system or equipment failure. Movement of shaft six degrees disengages clutch. Capacity 60 hp at 4000 rpm. Weight 4.88 lbs.

HYDRAULIC BRAKE FLUID RESERVOIR WITH VISUAL WINDOW

A simple, lightweight reservoir for hydraulic brake fluid. Visual window shows fluid level and indicates "full" and "refill" levels.

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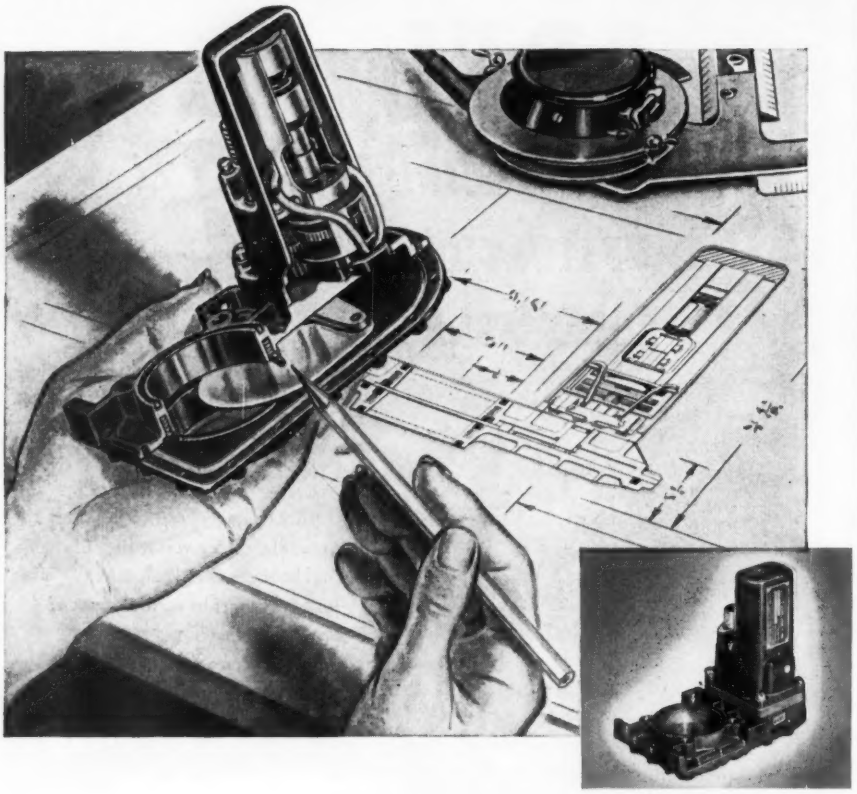
Whittaker MOTOR SLIDE VALVES...



DESIGNED TO WORK Together!

FROM THE MOMENT design begins—to final assembly and testing, WHITTAKER actuators and valve bodies are developed as one unit. They are designed to work together to assure a perfect relationship between working parts, and to provide an actuator unit that will operate most efficiently with a given valve body.

Both actuator and valve body are individually engineered for your specific installation. They are developed as a unit, made in the same plant, and assembled and tested together. WHITTAKER'S integrated facilities save valuable, engineering, purchasing and assembly man-hours. Make your engineer's job easier by bringing your valve problems to WHITTAKER—the only manufacturer offering a completely integrated service from original design to final installation and servicing. Contact our Engineering-Sales Department. WM. R. WHITTAKER CO., LTD., 915 North Citrus Avenue, Los Angeles 38, California.

Whittaker

First IN DESIGN
First IN PERFORMANCE
First WITH VALVES THAT ARE FIRST CHOICE IN INDUSTRY

loss in rudder effectiveness was noticed.

The airspeed system performed satisfactorily throughout most of the two hours, but toward the end a fluctuation in the airspeed was noticed. A gradual increase in power was required to maintain a speed of 160 mph. As the airplane entered the icing condition the power was 700 bhp. per engine. After two hours, the power had been increased to 1450 bhp. per engine. All other components operated satisfactorily under the icing conditions encountered.

▶ **The Record**—In conclusion, it might be well to review the achievements of the Neptune. It holds the world's record for non-stop flight without refueling: In September, 1946 a P2V dubbed the "Truculent Turtle," flew from Perth, Australia, to Columbus, Ohio, a total Great Circle distance of 11,236 mi.

Another P2V hold the distinction of being the largest plane ever to be flown off a carrier. JATO takeoffs from the "Coral Sea" have been made at gross weights up to 75,000 lb. Navy photo-recon has used the P2V for mapping a large section of rugged Alaskan terrain and rescue units have found the craft well suited for life boat drops to survivors in the ocean, as well as arctic rescue work, for the plane can be fitted with skis.

New power plant installations have been designed, the latest being the Wright R-3350-30W compound engine. With this engine, lower specific fuel consumption will be realized which will further improve the range of the P2V.

Actuator Developed To Prevent "Jams"

Details of a non-jamming electric actuator, designed to insure non-failing and instant operation of critical control surfaces on high-speed aircraft, have been disclosed by AiResearch Mfg. Co., Los Angeles, Calif.

The new device, called a torsional-friction, non-jamming, positive-stop actuator, is stated to differ from other actuators in that it employs a torque bar inside the jack screw.

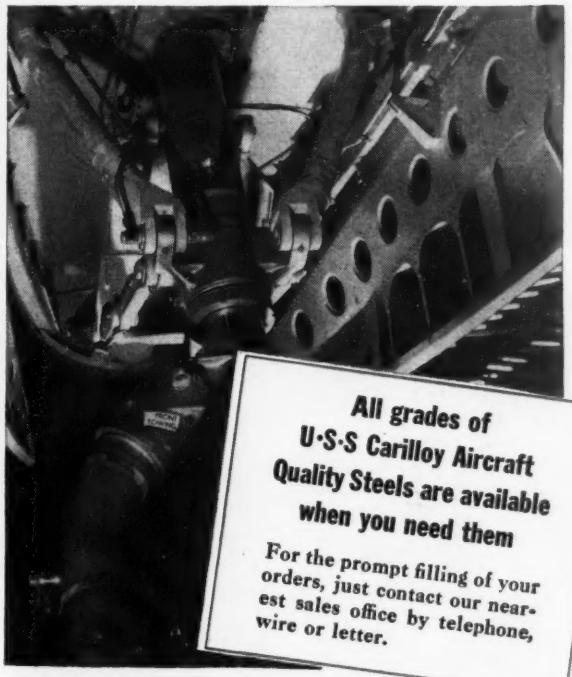
This bar is intended to absorb the jam shock at the end of the actuator stroke and store up energy like a spring for the return stroke. Effect is to eliminate an internal jam and initiate positive action in the opposite direction.

The unit reportedly are being produced for the F-86 and other jet aircraft. Although smaller than a man's hand, it is claimed to have withstood over 100 successive jam loads of 1½ tons each without indication of failure.

The Navy's 180-passenger Lockheed Constitution. A specially designed 4-wheel truck type landing gear on each side of the plane spreads the 92-ton load over such a wide surface that all CAA Class 4 airports will accommodate this giant transport.

The bigger they get the more they need

the concentrated strength of Alloy Steel



All grades of U·S·S Carilloy Aircraft Quality Steels are available when you need them

For the prompt filling of your orders, just contact our nearest sales office by telephone, wire or letter.

THE 92-ton Constitution, the 110-ton Flying Wing, and the 163-ton B-36 are clear evidence of the fact that gross weights are getting bigger all the time. That these enormous flying tonnages can be brought safely to earth is a tribute both to the men who design and build landing gear equipment and to the strong, tough steels that go into it.

With every increase in the strength requirements demanded of landing gear parts capable of handling our bigger and mightier planes, U·S·S Carilloy Aircraft Quality Steels have demonstrated again and again just how much resistance to shock, impact and sudden stresses can be packed into comparatively small sections.

These superior, service-tested steels have proved indispensable wherever extremely high strength-volume ratio is essential. Their wide use in the largest and finest landing gear equipment developed to date recommends their choice for whatever similar applications you have in mind.

Our metallurgical representatives who during the war and since have closely cooperated with aircraft builders in applying U·S·S Carilloy Steels not only in landing gears, but other vital air-frame parts and in engine construction will be glad to put their experience at your service. We believe you will find their suggestions helpful and practical.

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Westinghouse

A Lift and a Light for Berlin

"Aircraft's greatest achievement." That statement has been applied many times to the Berlin Airlift. And rightly so. The Airlift has changed all military logistic concepts . . . lessons learned from the operation will affect the future of all aviation.

Among equipment selected for this vital task, the Westinghouse name appears with significant frequency . . . particularly in those applications where dependable performance counts most. Typical examples are shown on these pages. A new cargo hoist—more powerful and with many times the life of former units. Flashing beacon lights—that flash with a brilliance 9 times greater than the sun's. Transformers—that can take a direct stroke of lightning without failure.

These illustrate why, on the tough assignments—that call for unfailing performance—you'll find Westinghouse equipment being selected. And it is also why Westinghouse is your best source of supply for all your aircraft needs—from tiny aircraft lamps to powerful turbo-jet engines . . . from radio and radar to giant wind tunnels.

Check the complete line of Westinghouse Aircraft products. Call your local Westinghouse Office, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94797

Hoist speeds loading and unloading

Westinghouse engineering was put to test when asked to design a cargo hoist unit that would be dependable under all conditions . . . be completely explosion-proof. The answer is illustrated here. This unit can lift 4,300 lbs. of cargo at 24 feet per minute . . . weighs only ninety-two pounds. The assembly consists of a twenty-four volt motor, a triple planetary gear, a speed limiter and a magnetic brake. Because of its long life, no spare need be carried by the plane, saving weight.

Lights penetrate heaviest fog

A major problem of the Airlift has been its flight-grounding fog. To combat this condition, Westinghouse Flashing Beacon Lights are being installed at seven Airlift fields for identification purposes. These lights make visual landings possible under worst weather conditions. Flashing 40 times a minute, the light can penetrate the heaviest fog for a distance of at least 1,000 feet. However, the peak flash does not blind the pilot because its apparent duration is so short. On clear or hazy days, or clear to light foggy nights, the intensity can be reduced.

Sure transformer operation

The "CSP" (Completely-Self-Protecting) transformer—long accepted as the best transformer under all conditions—protects itself against lightning, short circuits and overloads. At the Airlift, 414 "CSP" transformers are being used for approach and other airfield lighting.

Westinghouse

LEADER IN AVIATION EQUIPMENT

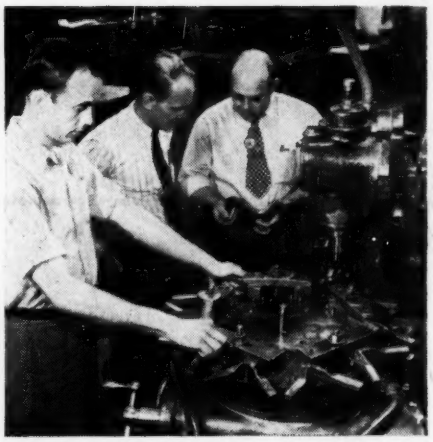
Machine Idle-Time Cut at Martin Plant

A routine project to break a machine shop bottleneck has led to a 25 percent increase in milled parts production, at The Glenn L. Martin Co., Baltimore, Md.

When it became apparent that two contracts, scheduled to reach the machine shop simultaneously, would create a serious overload in the milling section, the company decided the most economical solution would be found in stepping-up productivity of existing equipment to absorb the overload.

► **Utilization Study**—As the first step in accomplishing this, methods engineers made a detailed study of machine utilization in the milling section to determine specific measures required.

The resulting methods analysis, while pointing to the solution of the bottleneck, also became the basis for a revamped operations program which has increased running time on machines by 50 percent, and total production of parts by more than 25 percent in the mill section. According to the company, the program has saved thousands of dollars.



► **Breakdown**—First part of the analysis covered a breakdown of mill operations showing total running time and idle time on machines. Total idle time then was broken down into these percentages: job planning, 7.9; layout, 8.7; tooling, 8.2; work set-up, 61.2; reset-up, 2.4; leader inspection, 5.2; and miscellaneous causes, 6.4.

Each category of idle time operations was thoroughly investigated for weak spots causing precious minutes to be wasted. Under job planning, for example, the survey blamed loss of run time on assignment of machines that were ill-adapted to the job, or on poor sequencing of separate steps involved in milling some particular part. It was found that this condition existed partly because the foreman often did not have sufficient time to follow through on a job.

The report recommended that job planning in the shop be carried out completely at the supervisory level and that the foreman be relieved of certain time-consuming responsibilities which could be better done by other groups in the first place.

The survey revealed that time often was wasted because a job write-up prepared in tool planning might specify a machine that would be unavailable when the job reached the floor. It was recommended that an operations planner be placed in the shop to make spot revisions of job write-ups whenever indicated.

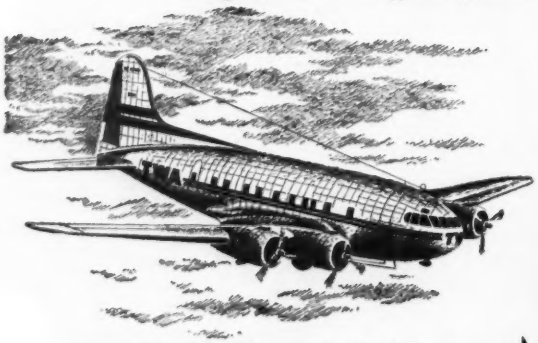
All idle time operations were analyzed in this manner and tightened-up with time-saving recommendations.

► **Productivity**—Turning from the idle-time reduction phase of the survey, the methods men made a number of suggestions aimed at increasing the productivity of the machines on the run time available. Besides showing ways to streamline step-by-step performance of the operator at his work, they recommended that speed-up jigs and fixtures be devised for some jobs.

In one case where production was increased by an improved jig, the bracket for a main beaching gear was origin-

what TWA likes about EDISON FIRE DETECTION

"...millions of miles without a single false engine fire warning."



Mr. L. R. Koepnick, Chief Engineer, Trans World Airline

WE RECENTLY asked Trans World Airline what they considered important features of Edison Fire Detection. In their answer,* Mr. L. R. Koepnick, Chief Engineer, states that TWA's Edison-equipped DC-3's and Boeing Stratoliners have now flown millions of miles *without a single false engine fire warning.*

An impressive record, but not unusual for the Edison Fire Detection System. It is also probably an important reason why the Edison System is used on *every* major U. S. airline, and why it has been approved by the U. S. Air Force for *all* reciprocating engine installations.

* Copy of Mr. Koepnick's letter detailing TWA's reasons for selecting Edison Fire Detection will be gladly sent on request.

EDISON FIRE DETECTION

INSTRUMENT DIVISION
Thomas A. Edison, Incorporated
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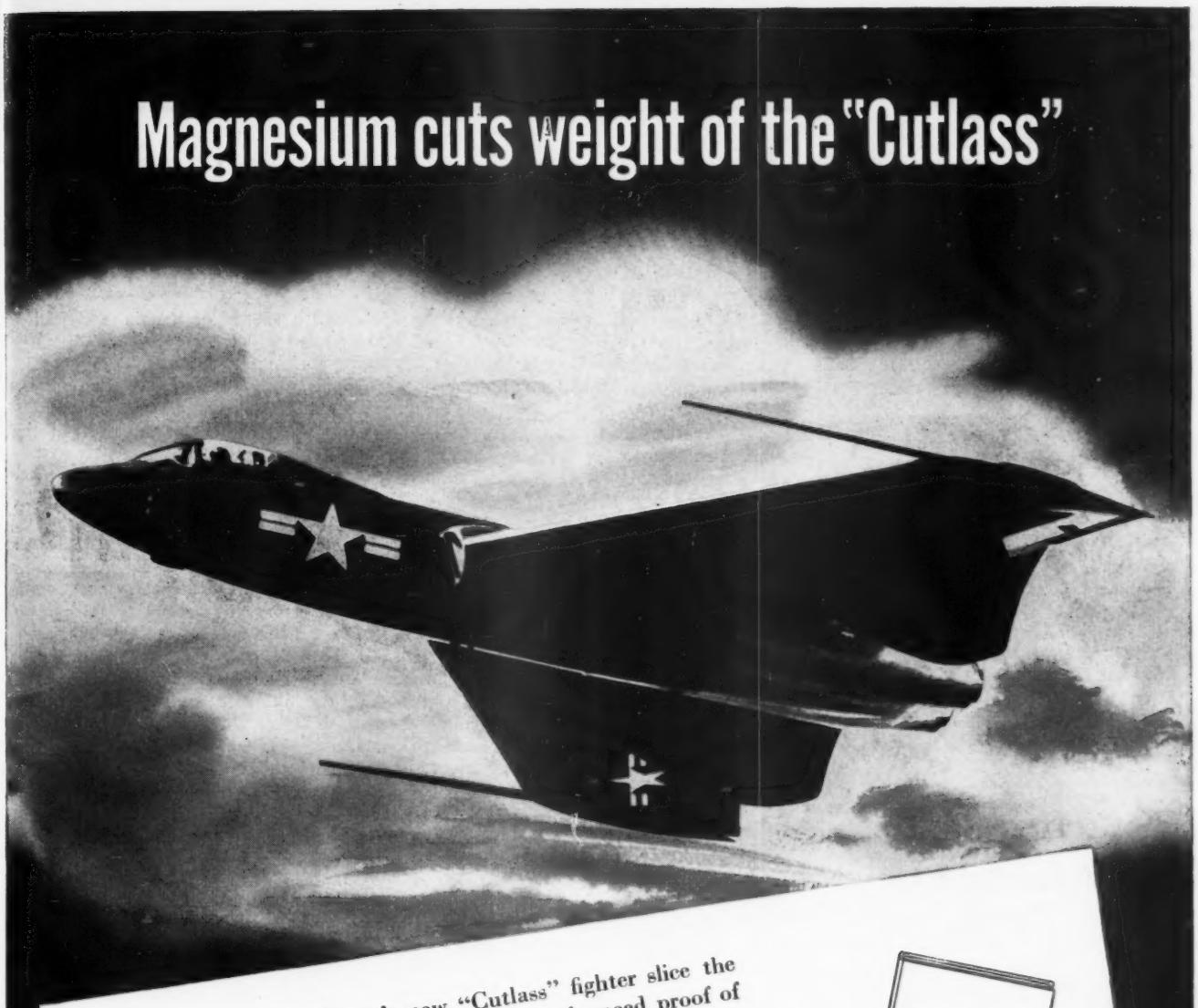
Magnesium cuts weight of the "Cutlass"



When you see the Navy's new "Cutlass" fighter slice the sky at over 600 mph . . . you're seeing high-speed proof of magnesium's ability to slice aircraft weight!

This sleek, swept-wing plane, built by Chance Vought, uses proportionately more magnesium alloy than any other craft. Its lighter weight gets more speed out of the powerful twin-jet thrust. Numerous parts in both engines and airframe are American Magnesium Corporation castings, forgings and extrusions.

When you design to increase thrust-weight ratio or add stiffness, remember these facts. Magnesium is 35% lighter than aluminum, 75% lighter than steel. Weight for weight, it is twice as stiff as aluminum, 18 times as stiff as steel. Take advantage of Alcoa's 61 years of light-metal experience. Consult your nearby Alcoa sales office. Or write ALUMINUM COMPANY OF AMERICA, sales agent for American Magnesium Corporation products, 2182-G Gulf Bldg., Pittsburgh 19, Pa.

DESIGNING WITH MAGNESIUM
—Write for your free copy of this helpful 329-page book. Contains full information on properties, design and fabricating practice.

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ALUMINUM and MAGNESIUM

INGOT • SHEET & PLATE • SHAPES, ROLLED & EXTRUDED • WIRE • ROD • BAR • TUBING • PIPE • SAND, DIE & PERMANENT MOLD CASTINGS • FORGINGS • IMPACT EXTRUSIONS
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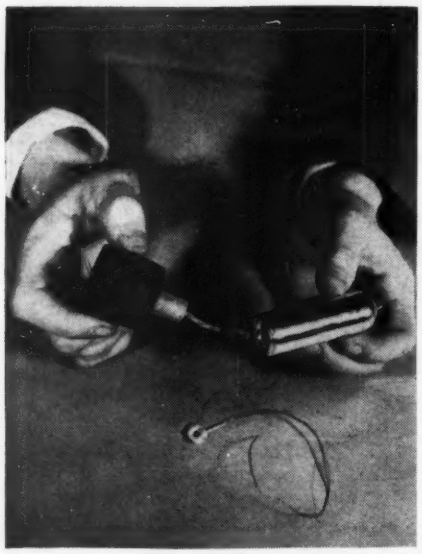
ally loaded on the work table and milled—one unit at a time. The operator had to stop the machine while loading each successive part in the vise. Now, a rotary work table with ten nesting fixtures located around its periphery is used (shown). With this arrangement, the operator is constantly occupied in loading parts, and while he is doing this, the machine keeps chipping away.



New Aerograph for More Adequate Data

The science of aerology may soon increase the accuracy of its data through the use of a "hypsometer" designed by General Electric Co. engineers for the Signal Corps Engineering Laboratories at Fort Monmouth, N. J. The device is simple, dependable and extremely lightweight.

Providing much increased accuracy at altitudes between 35,000 and 100,000 ft., it is designed to replace conventional pressure-sensitive, bellows-operated aerographic data, which is undependable at extremely high altitudes due to the low pressures and low rate-of-change of these pressures.

▶**Temperature Reading**—The hypsometer gives the basic altitude scale against which humidity and temperature is plotted in aerological investigations. It transmits temperature rather than pressure changes to the ground telemeter receiver. It uses the classic relationship (Law of Ramsey and Young) between pressure and boiling point to obtain this temperature reading. The reading is converted into an altitude by computation. It is claimed accurate within 0.001 ft.

▶**Theory**—A liquid boils when its vapor pressure equals atmospheric pressure. Since atmospheric pressure varies inversely as the altitude, the vapor pressure of the liquid required for boiling falls off with increasing altitude. Consequently, the amount of heat required to produce the vapor pressure needed for boiling also drops with altitude.

Once heated to the boiling point at sea level, the liquid will continue to boil as it is carried aloft in a radiosonde, provided the excess buoyancy of the latter is great enough to carry it upward at a vertical velocity exceeding that for equilibrium between the lapse rate of the boiling liquid and the atmospheric temperature gradient.

▶**Construction**—The G-E hypsometer consists of a small flask into which several ounces of liquid are placed. Although water may be used, the liquid is carbon disulphide, which has a lower freezing point than water, thereby permitting higher altitude surveys. Heat is applied to the liquid only on the ground until it is boiling. After the radiosonde is released, the liquid continues boiling until its temperature drops below its freezing point. Throughout the ascent, other instruments transmit humidity and temperature data.

A temperature-sensitive resistor is mounted in the unit, which changes resistance with the change in temperature of the vapor given off by the boiling liquid. This change in resistance changes the frequency of the telemeter signal indicating altitude.

ENGINEERING FORUM

Jet Fighters Held Match for B-36

Reader explains chances of interception and claims it has always taken a "David" to knock out a "Goliath."

I have been reading with great interest the articles on the B-36 versus jet fighter protection in AVIATION WEEK.

Let me say first of all, that I think the B-36 is a very fine machine and, I believe, one that will see us safely through any emergency. There has been a slight tendency for past criticism of this fine bomber to be biased against, and now in its defense the same frame of mind appears to be held towards jet fighters by its defenders.

▶**Climb Figures**—One of the main points emphasized by your periodical has been that as radar gives only a 30 minutes warning of approach of a B-36, the defense is unable to climb to the operation height of the B-36, circa 40,000 ft., in 30 minutes. It is now over one year since an RAF Vampire climbed to 40,000 ft. in 7 minutes and 45 seconds; a few weeks ago, an RAF Meteor climbed to 39,000 ft. in 7½ minutes.

Both these planes are among the oldest jets flying today; the Meteor saw active service in the war. Here in America where more advanced jets are in operation, jets that have been proved faster, you say we don't have one capable of climbing to 40,000 ft. in 30 minutes. Something is wrong somewhere; surely it is not the claims for our planes.

▶**Speed Difference**—A jet "scrambled" to meet a B-36 could be vectored directly to the bomber and would have at least 20 minutes in which to engage the "enemy" before "bombs away." You base your assumption on the fact that only one fighter is to engage the bomber, and you would be right there, but a defender suspecting an A-bomb carrier would send plenty of jets aloft to deal with the intruder.

The jet and the B-36 meet at almost 1000 mph., so any hits would be flukes. Yet this same jet can only close on the B-36 at 80 mph. What has happened to the other 120 mph. margin possessed by the jet in the head-on encounter—the 1000 being made up of 600 and 400?

Similar to passes at the Japs in the past war, the pursuit pilot is not going to mix it with the fellow who can out turn him, but instead make one swift pass from "three quarters." Ten jets attacking a B-36 in this manner might suffer a 30 percent loss, but would be almost certain to damage the big boy, because the lightest armament will probably be 20-mm. and higher. And with an obvious improvement on the gyro sight method of fire control, engagement could be opened at extreme range.

Far be it from me to advise the big brass what to do, but it seems foolish to fly into a "flap" over the fact that a B-36 outmaneuvered a jet at 40-odd thousand feet. It seems equally foolish to build an air destroyer to cope with the B-36 problem. One plane capable of taking on equally the B-36 in fire power and maneuverability would most definitely be too slow in rate of climb to get anywhere near the "enemy" before the target was reached.

It is highly likely that an enemy wanting to destroy a prime target by atom bomb would not send in a lone B-36, but would risk at least eight bombers all coming in from a different compass point, with perhaps only one bomb amongst them. The question is, "Who has the ball?" We don't know, so all must be stopped. It still seems evident that the only planes capable of doing this are a large number of fast climbing pursuit interceptors.

Right on back through the ages, it has always taken the David to knock out the Goliath. Lets not be too hasty and scuttle our jet fighter program.

D. J. M. BLADES,
Atlanta, Ga.

The Navy's AD-2 Skyraider
The AD-2 Skyraider is the standard carrier-based attack airplane of the U. S. Navy. Now in production at Douglas Aircraft's El Segundo Plant, it is recognized as possessing the ideal characteristics for carrier operations.
...and its Oil Cooler

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Superior strength-weight ratio derived from Clifford's patented method of brazing aluminum and accurate performance ratings obtained in the Clifford wind tunnel laboratory — largest and most modern in the aeronautical heat exchanger industry — account for the rapidly growing acceptance of Feather-Weight Oil Coolers.

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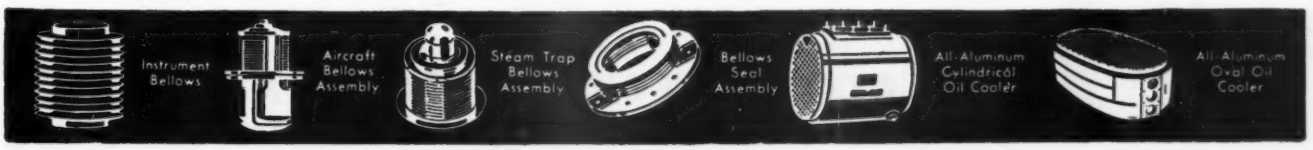

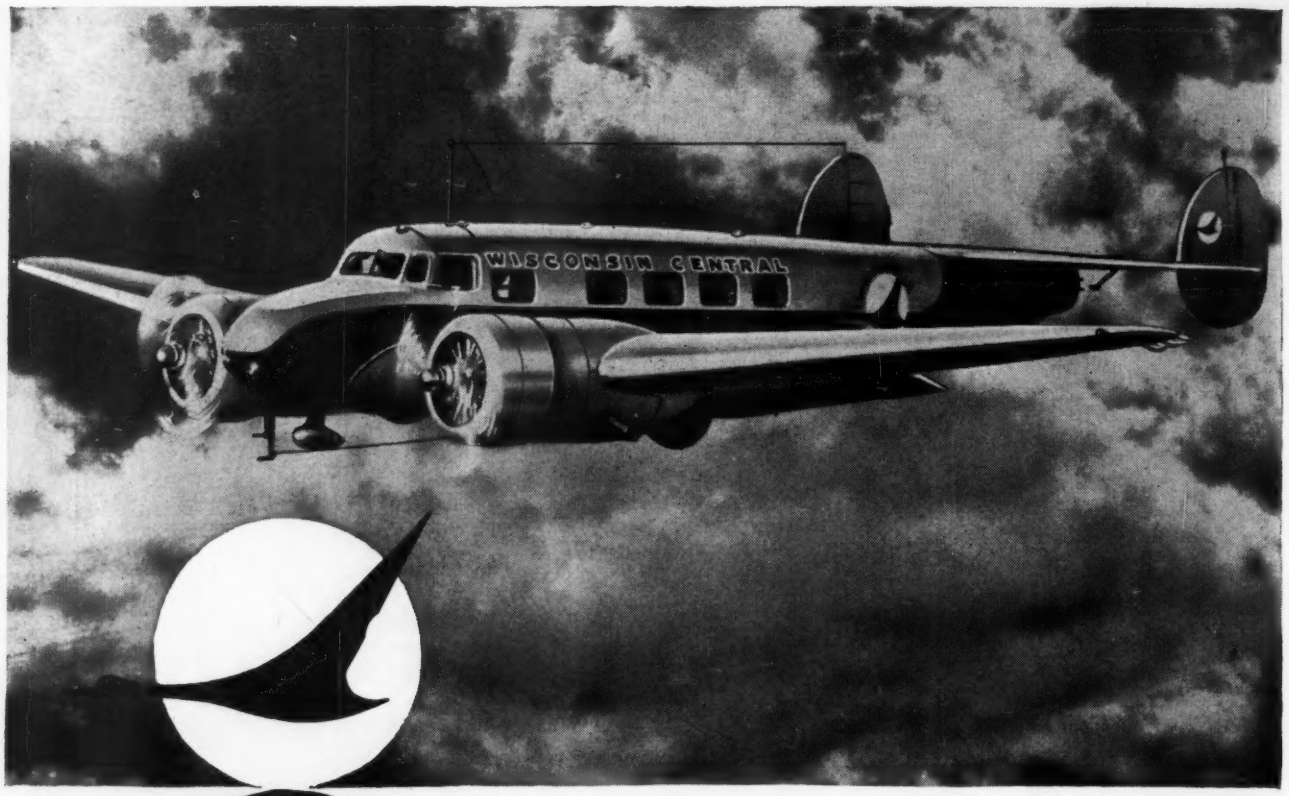

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MULTI-FREQUENCY GROUND STATION TRANSMITTER

WILCOX TYPE 99A—Provides simultaneous transmission on LF, MHF, and VHF, frequencies. Housed in a single steel cabinet, the rectifier, modulator, remote control, and 4 transmitting channels combine to make the most compact multi-frequency transmitter in the 400 watt field.

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WILCOX ELECTRIC COMPANY

KANSAS CITY MISSOURI

Progress Report

Airframe Weight—All Types

(In thousands of pounds)

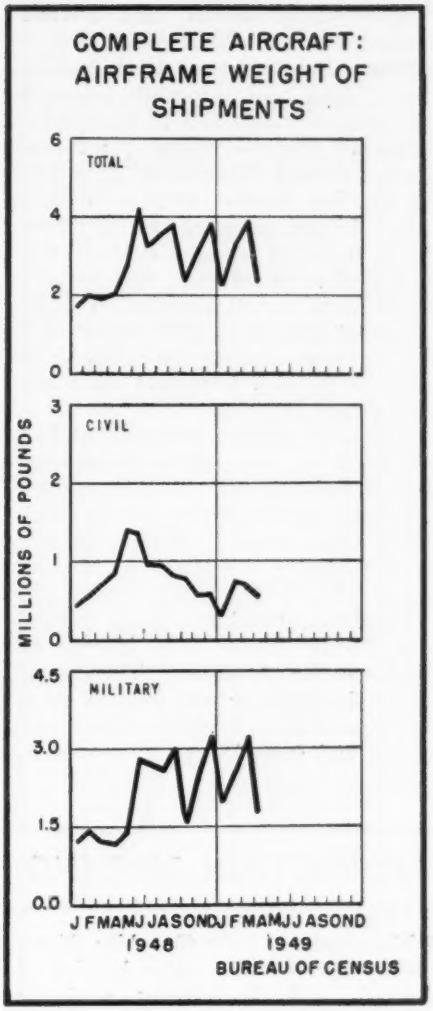
Type	1949 April	1949 March	Cumulative January-April 1949	Cumulative January-April 1948
TOTAL	2,355.5	3,937.5	11,929.7	7,770.8
Military aircraft	1,779.8	3,220.9	9,579.0	5,194.0
Civil aircraft, total	575.7	716.6	2,350.7	2,576.8
Personal	324.8	289.5	936.6	1,643.7
Transport	250.9	427.1	1,414.1	933.1
Civil aircraft, total	575.7	716.6	2,350.7	2,576.8
By number of places				
1-and 2-place	71.2	60.9	192.9	697.4
3-to 5-place	253.6	228.6	743.7	946.3
Over 5-place	250.9	427.1	1,414.1	933.1

Civil Aircraft—Number

Product	1949 April	1949 March	Cumulative January-April 1949	Cumulative January-April 1948
TOTAL	452	399	1,268	2,267
Personal	436	376	1,189	2,210
Transport	16	23	79	57
By number of places:				
1-and 2-place	132	113	354	1,248
3-to 5-place	304	263	835	962
Over 5 place	16	23	79	57

Civil Aircraft—Value

Type	1949 April	1949 March	Cumulative January-April 1949	Cumulative January-April 1948
TOTAL	$12,374,581	$15,806,566	$51,625,936	$46,094,221
Civil aircraft and parts	10,676,402	13,764,302	44,382,414	34,424,462
Aircraft	8,299,444	11,444,408	34,786,068	26,757,420
Personal type	2,058,844	1,856,418	6,041,834	9,663,943
Transport type	6,240,600	9,587,990	28,744,234	17,093,477
Aircraft parts	2,376,958	2,319,894	9,596,346	7,667,042
All other products	1,698,179	2,042,264	7,243,522	11,669,759


COMPLETE AIRCRAFT: AIRFRAME WEIGHT OF SHIPMENTS
TOTAL
CIVIL
MILITARY
MILLIONS OF POUNDS
J F M A M J J A S O N D J F M A M J J A S O N D
1948
1949
BUREAU OF CENSUS

Howgozit

1949 airframe weight for first four months far ahead of last year.

Aircraft production for the first four months of 1949 continued to surpass its 1949 level for the same period by a wide margin. Total of 11,929,700 airframe lb. were shipped during the first four months of 1949 compared with 7,770,800 lb. for the same period in 1948.

Projected at the first-third rate, the 1949 figures would mean an annual airframe production of about 36 million lb.

▶**April Decline**—Shipments of completed aircraft, as measured in airframe pounds, declined 40 percent during April, according to the latest figures compiled by the U. S. Bureau of Census. Total of 2,355,500 airframe lb. was shipped during April compared with 3,397,500 lb. in March. Bulk of the shipment (76 percent) continued to be military aircraft. Military production totalled 1,779,800 lb. compared with 3,220,900 lb. in March.

April shipments of civil aircraft amounted to 452 planes valued at $8.3 million (24 percent of total production). April civil shipments included 436 personal planes and 16 transports.

▶**Personal Planes**—Personal plane production showed a substantial drop during the first third of 1949 with 1818 planes shipped compared to 2210 planes during the same period of 1948. Transport production increased slightly with 79 delivered for this period in 1949 compared with 57 in 1948. Total civil aircraft production for the initial third of 1949 declined 9 percent from the same period in 1948.

Engine production for April totalled 3,594,600 hp., representing a 4 percent decline from March. Military engines accounted for 97 percent of the total. Total value of civil aircraft engines shipped during April was $1,120,697 compared with $1,163,978 for March.

Employment in both aircraft and engine plants showed little change in April over the March level. The Census data is based on reports received from 34 airframe manufacturers operating 41 plants, and from 13 engine companies operating 14 plants.

PRODUCTION BRIEFING

▶**Marquardt Aircraft Co.**, Van Nuys, Calif., reports a $3 million backlog of research and development work in guided missiles and propulsion methods for the Air Force and Navy.

▶**TEMCO** (Texas Engineering and Mfg. Co.), Dallas, has signed a new contract with the air force for cycled overhaul and reconditioning on mats C-54 transports used on the Berlin airlift. Beginning July 1 TEMCO will handle 25 C-54s per month for about five months. TEMCO's backlog is now between $3 and $4 million with sales during the first five months of 1949 totalling $5,814,766. This compares with sales of $1,496,133 for a similar period in 1948.

▶**Boeing Airplane Co.'s** Wichita division is seeking a total employment of 13,000 by next June to carry out the B-47 production program for the Air Force. Boeing's Wichita employment is now about 9300.

▶**Light Alloys, Ltd.**, Renfrew, Ont., has been sold to Dominion Magnesium, Ltd. with headquarters at Toronto. The Renfrew plant is making magnesium castings for British and Canadian jet engines.

Consolidated Vultee Aircraft Corp., Ft. Worth, Tex., promoted Robert H. Widmer from chief aerodynamicist to chief design engineer of division. Widmer supervised development work on the Convaid B-36 project.

Latest Air Force Bid Awards

Air Materiel Command procurement Division makes available to AVIATION WEEK the latest bid awards, shown on this page. Requests for further information should be addressed to Contracting Officer, ACM, Wright-Patterson AFB, Dayton, Ohio, attention: MCPPSX72, (AMC will resume in the near future the issuance of data on invitations for bids.)

ABSTRACTS

For 300 enlargers & lenses (49-1579):
Federal Manufacturing & Engineering Corp., Brooklyn, on a bid of $12,480.

For installation supervisory equipment (49-1632):
Wagner-Smith Co., Dayton, on a bid of $18,974.

For 23 pressurized testers (49-2042):
Sprague Engineering & Sales, Gardena, Calif., on a bid of $91,839.

For 3000 emergency sustenance kits (49-2055):
Lite Manufacturing Co., Inc., New York, on a bid of $28,290.

For 798 terminal strips & transformers (49-2081):
Companies sharing—Howard B. Jones Div., Chicago, on a bid of $10.56; Electronic Transformer Co., Inc., New York, on a bid of $4872.50; Thordarson Elec. Mfg. Div., Chicago, on a bid of $835.90; Srepco, Inc., Dayton, on a bid of $319.24, and Hallicrafters Co., Chicago, on a bid of $397.50.

For capacitors (49-2094):
Companies sharing—Aerovox Corp., New Bedford, Mass., on a bid of $195.71; Gudeman Co., Chicago, on a bid of $980; Westinghouse Elec. Corp., Dayton, on a bid of $300; Tobe Deutschmann Corp., Norwood, Mass., on a bid of $378; Sangamo Electric Co., Springfield, Ill., on a bid of $556, and Western Electric Co., Inc., New York, on a bid of $197.25.

For cable assemblies (49-2095):
Companies sharing—Federal Telephone & Radio Corp., East Newark, N. J., on a bid of $170; Winchester Electronics Co., New York, on a bid of $781; Continental Electronics, Ltd., Brooklyn, on a bid of $10,000, and Waltham Horological Mfg. Co., Waltham, Mass., on a bid of $292.

For blocks, links, etc. (49-2110):
Companies sharing—Bussmann Mfg. Co., Division of McGraw Electric Co., St., Louis, on a bid of $14,269.50, and Baltinger Electric Co., Inc., New York, on a bid of $1215.

For film (49-2116):
Companies sharing—Eastman Kodak Co., Rochester, on a bid of $15,206.42; E. I. du Pont de Nemours & Co., Inc., Wilmington, on a bid of $807.66; General Aniline & Film Corp., Binghamton, on a bid of $447.68; Ankon Chemical & Film Corp., Newton, N. J., on a bid of $2492.92, and Haloid Co., Rochester, on a bid of $377.23.

For 1120 antennas (49-2122):
Companies sharing—Moore-Eastwood Co., Dayton, on a bid of $9528.40; L. S. Brach Mfg. Corp., Newark, N. J., on a bid of $1478.40, and Cook Electric Co., Chicago, on a bid of $453.60.

For 7990 parachute assemblies (49-2124):
Companies sharing—General Textile Mills, Inc., New York, on a bid of $10,251; Pioneer Parachute Co., Inc., Manchester, Conn., on a bid of $8520, and K & W Hubbes Co., Delaware, O., on a bid of $13,500.

For isolators (49-2133):
Cleveland Pneumatic Tool Co., Cleveland, on a bid of $3723.

For 300 power unit grip (49-2144):
Hermann Manufacturing Co., Lancaster, O., on a bid of $8886.

For 451,200 2 way connectors (49-2185):
Aircraft Marine Products, Inc., Harrisburg, on a bid of $3646.98.

For 826 chairs (49-2186):
Charles G. Stott & Co., Inc., Washington, D. C., on a bid of $3381.

For brushing compounds (49-2194):
Companies sharing—Haviland Products Co., Grand Rapids, on a bid of $2187.08; Dykem Co., St. Louis, on a bid of $330.24, Interchemical Corp., Finishes Div., Newark, N. J., on a bid of $2310; Nox-Rust Chemical Corp., Chicago, on a bid of $1986.60; Glidden Co., Cleveland, on a bid of $2351.04; W. P. Fuller & Co., Los Angeles, on a bid of $15,807.75; R. M. Hollingshead Corp., Camden, N. J., on a bid of $18,171.40; Davies-Young Soap Co., Dayton, on a bid of $45.60; Dow Corning Corp., Midland, Mich., on a bid of $1173.16, and Turco Products, Inc., Los Angeles, on a bid of $2681.60.

For aircraft spares (49-2199):
Companies sharing—American Chain & Cable Co., Inc., Detroit, on a bid of $18,863.29; MacWhyte Co., Kenosha, Wis., on a bid of $2930.40; Parker Appliance Co., Cleveland, on a bid of $360; Monadnock Mills, San Leaniro, Calif., on a bid of $2176.10; Elastic Stop Nut Corp. of America, Union, N. J., on a bid of $8905.70; Air Associates, Inc., Teterboro, on a bid of $2085.16; National Lock Co., Rockford, Ill., on a bid of $279.12; Aircraft Products Co., Clifton Heights, Pa., on a bid of $42; Aero Supply Mfg. Co., Inc., Corry, Pa., on a bid of $2531.40; Clary Multiplier Corp., Los Angeles, on a bid of $1408; Standard Pressed Steel Co., Jenkintown, Pa., on a bid of $358.70; Weatherhead Co., Cleveland, on a bid of $4357; Aeroquip Corp., Jackson, Mich., on a bid of $12,929.50; Deutsch Co., Los Angeles, on a bid of $524.60; Camloc Fastener Corp., New York, on a bid of $641.50; Dzus Fastener Co., Inc., Babylon, N. Y., on a bid of $6322.08; Ideal Clamp Mfg. Co., Inc., Brooklyn, on a bid of $900; Aircraft Fitting Co., Cleveland, on a bid of $1840; Irvin W. Masters, Inc., Burbank, on a bid of $1260; Aircraft Hardware Mfg. Co., Inc., New York on a bid of $4920; Sanford Aircraft, Inc., Inglewood, Calif., on a bid of $838, and Pacific Piston Ring Co., Los Angeles, on a bid of $215.

For 137 collimator assemblies (49-2217):
Akeley Camera, Inc., New York, on a bid of $5830.72.

For 371 edging & sealing machines (49-2218):
Companies sharing—B. K. Elliott Co., Cleveland, on a bid of $52; Roth Office Equipment Co., Dayton, on a bid of $6476.80, and Derby Sealers, Inc., Derby, Conn., on a bid of $6771.

For 126 attenuators (49-2229):
Selector Industries, Inc., New York, on a bid of $5058.

For 383 motor dial assemblies (49-2250):
Companies sharing—Electric Sales Co., Inc., Boston, on a bid of $540; Electronic Transformer Co., Inc., New York, on a bid of $733.25, and Standard Electrical Products Co., Dayton, on a bid of $2900.

For 2718 plug assemblies (49-2251):
Companies sharing—Peerless Radio Distributors, Inc., Jamaica, N. Y., on a bid of $441.48; Concord Radio Corp., Chicago, on a bid of $62.35; Hallicrafters Co., Chicago, on a bid of $144; American Phenolic Corp., Chicago, on a bid of $175, and Western Electric Co., Inc., New York, on a bid of $2320.50.

For 100 enlargers (49-2258):
Arel, Inc., St. Louis, on a bid of $10,169.

For parachute assemblies (49-2272):
Pioneer Parachute Co., Inc., Manchester, Conn., on a bid of $549,217.20.

For alterations on building 79-D (49-2273):
B. G. Danis Co., Inc., Dayton, on a bid of $64,300.

For 540 filing & storage cabinets (49-2275):
Companies sharing—Parker Steel Products, Inc., Brooklyn, on a bid of $2605.50, and Security Steel Equipment Corp., Avenel, N. J., on a bid of $1233.

For oscillator assemblies (49-2415):
Super Electric Products Corp., Jersey City, on a bid of $41,179.32.

For 6455 cord (49-2427):
American Radio Hardware Co., Inc., Mount Vernon, N. Y., on a bid of $6455.

For 41 testers & printers (49-2445):
Companies sharing—Graflex, Inc., Rochester, on a bid of $398, and Morse Instrument Co., Hudson, O., on a bid of $13,303.65.

For mono-rail installation (49-2469):
Dayton Fabricated Steel Co., Dayton, on a bid of $7220.

For 1800 slates (49-2470):
McConnaughay Stationers, Inc., Springfield, O., on a bid of $21,600.

For generators (49-2276):
Espey Mfg. Co., Inc., New York, on a bid of $24,712.

For 100 cameras (49-2277):
Graflex, Inc., Rochester, on a bid of $11,157.

For regulator assemblies (49-2290):
Lindberg Engineering Co., Chicago, on a bid of $9190.

For valve assemblies (49-2299):
Companies sharing—Adel Precision Products Corp. Burbank, on a bid of $4783; Parker Alliance Co., Cleveland, on a bid of $2361.58; Aeroquip Corp., Jackson, Mich., on a bid of $125; Ruland Mfg. Co., Watertown, Mass., on a bid of $3600, and Endura Mfg. Corp., Quakertown, Pa., on a bid of $2.63.

For services & materials for wind tunnel (49-2303):
George W. Timmons, Columbus, O., on a bid of $50,905.

For modification dynamometer lab. (49-2307):
L. E. Stevens, Co., Cincinnati, on a bid of $29,550.

For piping system installation (49-2313):
L. E. Stevens Co., Cincinnati, on a bid of $149,800.

For rectifiers (49-2314):
Companies sharing — Mercury Electric Corp., Kansas City, Mo., on a bid of $57,987.24, and Richardson-Allen Corp., New York, on a bid of $129.

For printer (49-2318):
Photographic Instruments, Inc., New York, on a bid of $14,403.

For test stands (49-2343):
United Mfg. Co. Div., United Adv. Corp., New Haven, on a bid of $145,761.

For dryers (49-2355):
Burke & James, Inc., Chicago, on a bid of $5699.19.

For 162 dynamometers, & fixture assemblies (49-2212):
Companies sharing—Quick Tool Co., Chicago, on a bid of $2537.73 and W. C. Dillon & Co., Inc., Chicago, on a bid of $9882.

For photographic film (49-1755):
Companies sharing—Eastman Kodak Co., Rochester on a bid of $8725; E. I. du Pont de Nemours & Co., Inc., Wilmington, on a bid of $1929.75, and Haloid Co., Rochester, on a bid of $156.60.

For nut assemblies (49-1778):
Companies sharing—Trine Manufacturing Co., Richmond, Ind., on a bid of $2685; Boot Aircraft Nut Corp., Stamford, Conn., on a bid of $3844.23; Elastic Stop Nut Corp. of America, Union, N. J., on a bid of $84,604.70; Clary Multiplier Corp., Los Angeles, on a bid of $1911.82; Nutt-Shel Co., Los Angeles, on a bid of $3107.25; Standard Pressed Steel Co., Jenkintown, Pa., on a bid of $5456.55; Tinnerman Products, Inc., Cleveland, on a bid of $4207.31, and Air Associates, Inc., Teterboro, on a bid of $11,608.80.

For plastic compound (49-168):
Naugatuck Chemical, Div. of U. S. Rubber Co., Naugatuck, Conn., on a bid of $266,332.30.

For connecting platforms (41-1792):
Jumbo Steel Products Co., Azusa, Calif., on a bid of $7728.

For brush assemblies (49-192):
Companies sharing—Eastman Kodak Co., Rochester, on a bid of $1681.50; Malone Camera Stores, Inc., Dayton, on a bid of $788.50; Ampro Corp., Chicago, on a bid of $134; Sun Ray Photo Co., Inc., New York, on a bid of $300; General Electric Co., Lamp Dept., Dayton, on a bid of $115; Graflex, Inc., Rochester, on a bid of $1206.50; Bell & Howell Co., Chicago, on a bid of $1786.25, and John M. Wall, Inc., Syracuse, on a bid of $350.

For gasoline hose (49-2010):
Hewitt-Robins, Inc., Buffalo, on a bid of $20,345.13.

For photographic equipment (49-2013):
Companies sharing—Haloid Co., Rochester, on a bid of $3929.76; Eastman Kodak Co., Rochester, on a bid of $2673.68, and Anken Chemical & Film Corp., Newton, N. J., on a bid of $2022.57.

For 42 airplane bags (49-2018):
United States Rubber Co., Mishawaka, Ind., on a bid of $19,194.

For adapters & back assemblies (49-2057):
Companies sharing—Kalart Co., Stamford, Conn., on a bid of $4440.30; Burke & James, Inc., Chicago, on a bid of $1967.21; Graflex, Inc., Rochester, on a bid of $14,306.29, and Eastman Kodak Co., Rochester, on a bid of $649.37.

For painting interior of wind tunnel (49-2153):
Klein Painting & Decorating Co., Dayton, on a bid of $42,300.

For oil spray guns (49-2160):
Electric Sprayit Co., Sheboygan, Wis., on a bid of $13,750.

For clothing (49-2245):
Companies sharing—Beaumont & Crandall Inc., Kansas City, Mo., on a bid of $5059.20; Lite Manufacturing Co., Inc., New York, on a bid of $2688; Sigmund Eisner Co., Red Bank, N. J., on a bid of $74,874; H. Bernstein & Co., Chicago, on a bid of $68,315.16, and Aviators Clothing Co., Inc., Beacon, N. Y., on a bid of $34,188.

For photographer's equipment (49-2259):
Companies sharing—Keystone Manufacturing Co., Boston, on a bid of $7276, and Projection Optics Co., Inc., Rochester, on a bid of $1909.20.

For 1000 transformers (49-2265):
American Gas Accumulator Co., Elizabeth, N. J., on a bid of $13,970.

For propeller stands (49-2316):
Cardell Manufacturers, Dayton, on a bid of $108,443.24.

For 3 steel storage tanks (49-2403):
Bethlehem Steel Co., Bethlehem, Pa., on a bid of $60,900.

For 2600 spare parts for airplane tail jacks (49-2408):
Companies sharing—Croll Freeman Corp., Yankton, S. D., on a bid of $2101.80; Jumbo Steel Products Co., Azusa, Calif., on a bid of $10,825; Ford Brothers, Inc., Buffalo, on a bid of $14,010, and United Aircraft Products, Inc., Los Angeles, on a bid of $4356.50.

For exposure meters (49-2419):
DeJur-Amsco Corp., Long Island City, N. Y., on a bid of $11,587.50.

For press, etc. (49-2420):
Marsden, Inc., Washington, D. C., on a bid of $5225.

For 3300 oil filter elements (49-1523):
Fram Corporation, Providence, on a bid of $9823.28. (correction)

For antenna assemblies (49-2493):
J. & H. Smith Mfg. Co., New York, on a bid of $32,669.50.

For 23 vertical tanks (49-2488):
Bethlehem Steel Co., Bethlehem, Pa., on a bid of $516,800, and Chicago Bridge & Iron Co., Cleveland, on a bid of $187,940.

For electrical equipment (49-2479):
L. S. Brach Mfg. Corp., Newark, on a bid of $17,163.93.

For 6300 element oil filters (49-2476):
Luber-Finer Incorporated, Los Angeles, on a bid of $22,680.

For belt assemblies (49-2475):
Companies sharing—Eaton Screw Products Co., Inc., Eaton, O., on a bid of $1,343.43; Irvin W. Masters, Inc., Burbank, on a bid of $2500; National Screw & Mfg. Co., Cleveland, on a bid of $302.40; Ohlson-Empire Division, Ohlson Intl. Corp., Long Island City, N. Y. on a bid of $6152, and Dzus Fastener Co., Inc., Babylon, N. Y., on a bid of $232.11.

For generators (49-2467):
Jack & Heintz Precision Industries, Inc., Cleveland, on a bid of $23,595.

For regulators & relays (49-2464):
Hartman Electrical Mfg. Co., Mansfield, O., on a bid of $9764.20, and Jack & Heintz Precision Industries, Inc., Cleveland, on a bid of $27,490.40.

For antenna assemblies (49-2441):
Mercury Electric Corp., Kansas City, Mo., on a bid of $7560.75.

For shackle bomb & spare parts (49-2440):
R. E. Dye Machine & Supply, Breckenridge, Tex., on a bid of $85,964.74.

For 1546 tarpaulins (49-2438):
Springfield Tent & Awning Co., Springfield, O., on a bid of $264,237.60.

For control stick switches (49-2432):
Guardian Electric Manufacturing Co., Chicago, on a bid of $17,012.60.

For nozzle (49-2431):
Companies sharing—J. C. Carter Co., Pasadena, on a bid of $16,185; Buckeye Iron & Brass Works, Dayton, on a bid of $3600.

For generators (49-2423):
Westinghouse Electric Corp., Dayton, on a bid of $129,805.

For 6831 belts (49-2418):
Aerial Machine & Tool Corp., Long Island City, N. Y., on a bid of $35,179.65.

For 11,073 belt assemblies (49-2417):
Aircraft Belt & Trim Corp., Los Angeles, on a bid of $52,375.29.

For 84 relay units (49-2405):
Industrial Electronics Co., Inc., Hanover, Mass., on a bid of $2871.12.

For 260 displayers (49-2401):
Companies sharing—Multiplex Display Fixture Co., St. Louis, on a bid of $8466.03, and Meilink Steel Safe Co., Toledo, on a bid of $4536.

For control panels (49-2396):
Companies sharing—Specialty Assembling & Packing Co., Inc., Brooklyn, on a bid of $24,513.49; Aermotive Equipment Corp., Kansas City, Mo., on a bid of $59,137.26; Dimco-Gray Co., Dayton, on a bid of $16,238.40, and Mercury Electric Corp., Kansas City, Mo., on a bid of $33,373.10.

For indicators (49-2376):
Weston Electrical Instrument Corp., Newark, on a bid of $30,155.30.

For solenoid (49-2374):
Cook Electric Co., Chicago, on a bid of $65,994.63.

For light & lamp assemblies (49-2368):
Crimes Mfg. Co., Urbana, O., on a bid of $7253.73.

For gages (49-2360):
United States Gauge Div. of American Machine & Metals, Inc., Sellersville, Pa., on a bid of $11,905.28.

For photographic equipment (49-2354):
Companies sharing—Anken Chemical & Film Corp., Newton, N. J., on a bid of $3300.82; Eastman Kodak Co., Rochester, on a bid of $11,278.52; Haloid Co., Rochester, on a bid of $3004.86, and Grant Photo Products, Inc., Lakewood, O., on a bid of $509.40.

For alternator assemblies (49-2340):
Eicor, Inc., Chicago, on a bid of $543,218.50.

For generators (49-2302):
General Electric Co., Lynn, Mass., on a bid of $109,238.85.

For 975 brackets & gun trunnions (49-2295):
Inland Equipment Co., Nashville, on a bid of $2773.05.

For bolts (49-1960):
Companies sharing—Aero Supply Mfg. Co., Inc., Corry, Pa., on a bid of $4961.38; Continental Screw Co., New Bedford, Mass., on a bid of $9332.36; National Lock Co., Rockford, Ill., on a bid of $11,412.72; Cooper Precision Products, Los Angeles, on a bid of $2360.33; Lamson & Sessions Co., Cleveland, on a bid of $2962.39; E. W. Perry Screw Products, Inc., Berea, O., on a bid of $1228.16; Standard Pressed Steel Co., Jenkintown, Pa., on a bid of $1168.92; Air Associates, Inc., Teterboro, on a bid of $4077.50; and Aircraft Hardware Mfg. Co., Inc., New York, on a bid of $2899.05.

For replacement spares on aircraft (49-1891):
Companies sharing—American Door & Machine Co., Los Angeles, on a bid of $2871.50, and Aircraft & Aircraft Supplies, Los Angeles, on a bid of $815.30.

For 11,000 transformers (49-1713):
American Gas Accumulator Co., Elizabeth, N. J., on a bid of $205,322.

For audio oscillators (49-1644):
Specialty Assembling & Packing Co., Inc., Brooklyn, on a bid of $400,000.

For cameras (49-1640):
Cameraflex Corp., New York, on a bid of $365,699.23.

For 247 transformers (49-819):
Companies sharing—U. S. Radio Supply, Chicago, on a bid of $2020.95, and Electronic Transformer Co., Inc., New York, on a bid of $1739.30.

For 1002 costomers & receptacles (49-2271):
Companies sharing—The Roth Office Equipment Co., Dayton, on a bid of $1350, and Crown Office Supply Co., Chicago, on a bid of $1162.90.

Behind the Scenes

Several months ago, we discussed on these pages one particular problem in the design and development of modern propeller blades — fatigue. It was a story of test, test and more test. Here, we would like to tell you a little of the creative design work that goes on behind the scenes at Hamilton Standard.

This work is quite different than testing, for we are not in the laboratories surrounded by complicated and intriguing machinery. We are at a desk with nothing more than a slide rule, pencils, formulas and charts. Our objective is the aerodynamic design of efficient propellers and the selection of the most suitable design for a given airplane installation. The "tool" used in achieving this objective is called "strip analysis".

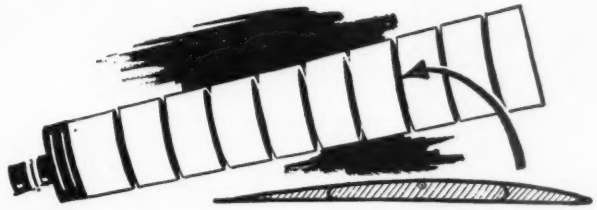
Refinements in propeller blade design were of secondary importance in the past. Today, they have assumed major importance because of higher speeds, greater engine powers and increased loads. Now, even small improvements in propeller performance can produce large economic benefits to operators of modern aircraft. For example, in the case of an airplane whose take-off and climb performance is critical with a given load, a propulsive efficiency improvement of as little as 1% or 2% can increase the maximum permissible payload from 10% to as much as 50%.

In the past, propeller designs were based on data gathered from wind tunnel and flight tests. This was costly and time-consuming and rarely resulted in a design of maximum efficiency. Now, since small performance changes have come to mean so much, propeller designers must try to work to the last fraction of a percent in propeller efficiency. As a result, this new strip analysis method has been developed and refined by Hamilton Standard engineers to a point where the comparative accuracy is within plus or minus one-half of one percent. Such continuous design leadership and thorough research have contributed much to the progress of aviation.

On the opposite page are questions and answers which will give you some idea of this one phase in our interesting but complex work of designing, developing and producing Hamilton Standard propellers.

at Hamilton Standard

WHAT IS STRIP ANALYSIS?



Strip analysis is comparatively simple — physically. It consists of selecting narrow cross-sections of a blade about every 10% of its length. The same vortex theory which forms the basis for airplane wing design is then applied to the study of each section of the blade. In both cases, the air forces acting on a series of spanwise sections are individually computed and then integrated to determine total forces. In other words, we can mathematically predict the exact performance of any given propeller on any specific airplane, even before it is built. Since this method involves the analysis of sections or strips of the blade, it is called strip analysis.

HOW OLD IS STRIP ANALYSIS?

- ☐ 5 Years?
- ☐ 10 Years?
- ☐ 15 Years?

This precise analytical method has been developed over the past 15 years and has been used by Hamilton Standard for more than ten years in designing new blades. However, computations by this method were laborious, time-consuming and expensive. Over the past five years, with the increasing requirements for blades of maximum efficiency, and with the accumulation of test data proving our calculations, there has been a growing requirement for a broader application of this method. Hamilton Standard undertook this task and, as a result, the strip analysis method has been streamlined so that the calculation of a complete performance analysis now takes only one-quarter of the time previously needed. This permits not only the improved design of new blades, but rapid and accurate evaluation of existing designs for specific airplane installations.

3% GREATER EFFICIENCY FROM A DC-6 BLADE ALLOWED HOW MUCH GREATER PAYLOAD?

- ☐ 40 Pounds?
- ☐ 400 Pounds?
- ☐ 1,400 Pounds?

Some notable examples of the value of strip analysis occurred in connection with propellers on the Douglas DC-6 and the Boeing Stratocruiser. In the case of the DC-6, it was desired to increase the maximum permissible gross weight of the airplane. A slight re-design of the propeller blade by the strip analysis method gave promise of a 3% improvement in efficiency to meet the new requirement. Our calculations were confirmed during the airplane certification tests, and the plane was certificated for an increase of 1,400 pounds in gross weight. This could mean nearly 250 more gallons of gasoline or as many as seven extra passengers. Similarly, on the Stratocruiser, a predicted improvement in propeller performance due to a modification in design was confirmed by a substantial improvement in airplane performances during certification tests.

WHICH BLADE IS BEST FOR TAKE-OFF AND CLIMB?

- ☐ Narrow Blade?
- ☐ Wide Blade?
- ☐ Compromise?

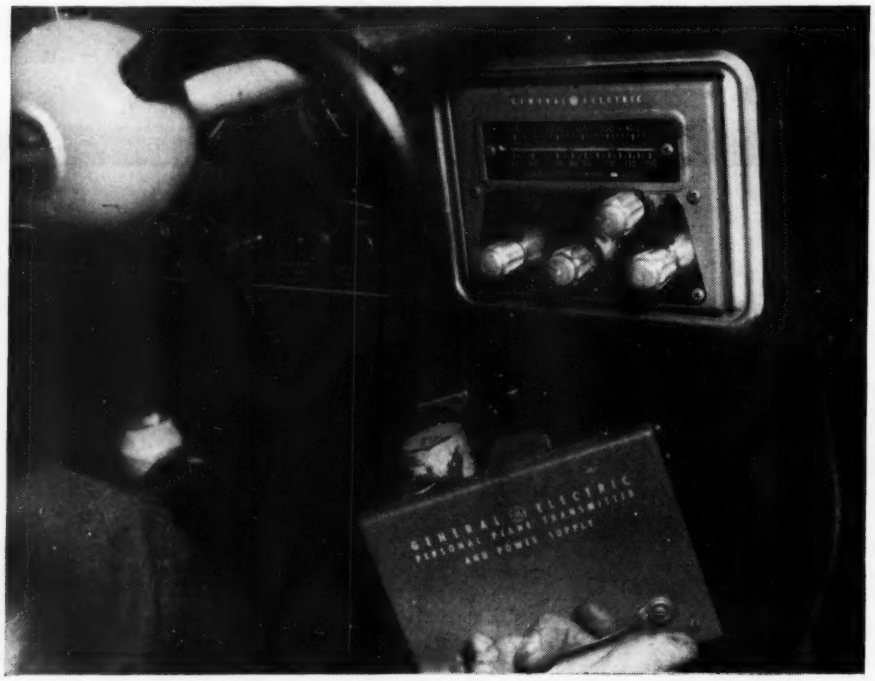
It would be natural to suppose that a wide blade would increase the power capacity of the propeller and thus provide improved take-off and climb performance. Empirical data, such as has been used in the past, would support such a theory. But, here again, the value of strip analysis is being demonstrated. In certain cases, comparable power absorption can be achieved with a narrower blade designed with refined airfoil sections, yet retaining the same diameter. The resulting benefits are obtained through noticeable weight saving in the blade itself, and, due to lower stresses, in the shank and hub of the entire propeller. And every pound saved means better performance characteristics — range, climb, payload, altitude or speed. In cases where use of wide blades is still dictated by certain factors, the efficiency of these also may be increased by redesign through the strip analysis method.

HAMILTON STANDARD

ONE OF THE FOUR DIVISIONS OF UNITED AIRCRAFT CORPORATION

EAST HARTFORD, CONNECTICUT

NEW AVIATION PRODUCTS



New Lightplane Transceiver

Represented to give private planes better air-to-ground contact, lightweight AK-50 radio communication package, developed by **General Electric Co.**, Electronics Park, Syracuse, N. Y., features VHF transmitter with six channels, in addition to usual low frequency transmitter. Kit also includes power supply unit and two-band low frequency receiver for broadcast reception, navigation range signals, weather reports and tower communication.

Receiver has pre-set "tower" tuning position which permits switching from radio range to tower frequency without changing setting on main tuning dial.

Other features are built-in interphone system and noise limiter to facilitate reception through heavy static. Kit comes in two sections with low frequency receiver and VHF transmitter combined on one mount (on panel) and low frequency transmitter and power supply on the other.

Rugged Coupling

For beacons, searchlights and other equipment exposed to the elements, 1600 Series quick-disconnect coupling, offered by **Roylyn, Inc.**, 718 W. Wilson Ave., Glendale 3, Calif., is intended to meet requirements of heavy-duty electrical connector that is impervious to moisture and capable of withstanding long periods of immersion without leakage.

Designed according to AN-specifications, coupling is provided either with pressure tight cable seals or is threaded for attachment to conduit, bulkhead or panel. Only quarter turn is required to make or break unit.

It can be used with coaxial cables and electronic equipment, and has been successfully tested by Navy against moisture and leakage under high pressure.

Sealing Tape

Exhibiting potential for sealing flying boat hulls, floats, aircraft flooring, and non-structural joints, "Chrome Lock" gasketing and weathersealing tape, offered by **Products Research Co.**, 5426 San Fernando Rd., Glendale, Calif., is compounded resin-impregnated felt containing zinc chromate as corrosion inhibitor.

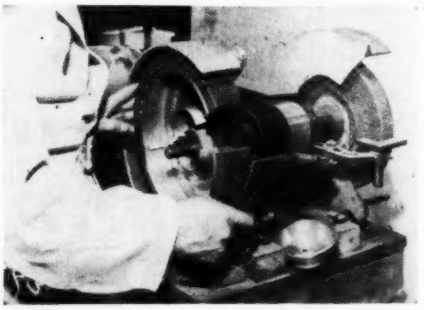
Adhesive backing on material makes it possible for one man to lay quickly hundreds of feet of gasketing on vertical or inverted installations. Tape is odorless and non-toxic, and is represented to maintain positive seal for the life of the joint.

Product is stated to remain pliable indefinitely, resist distortion (75-100 percent recovery after pressure release), prevent rust in new joints, and arrest corrosion in old installations.

Material fills in all face irregularities and extrudes sufficient resin on fraying surfaces to make positive dam for retention or exclusion of air, water, dust, etc. Manufacturer claims product completely inhibits electrolytic action between dissimilar metals.

Tape is non-soluble in water or saline solutions and, under locked pressure, maintains anti-wicking protection. For non-flammable installations, Chrome Lock Type N is recommended. Maker guarantees it will not support combustion.

Tape is available in $\frac{1}{32}$, $\frac{1}{16}$, $\frac{1}{8}$ and $\frac{1}{4}$-in. thickness, and in any width from $\frac{3}{16}$-72 in. It comes in 100, 50, and 25 ft. lengths.



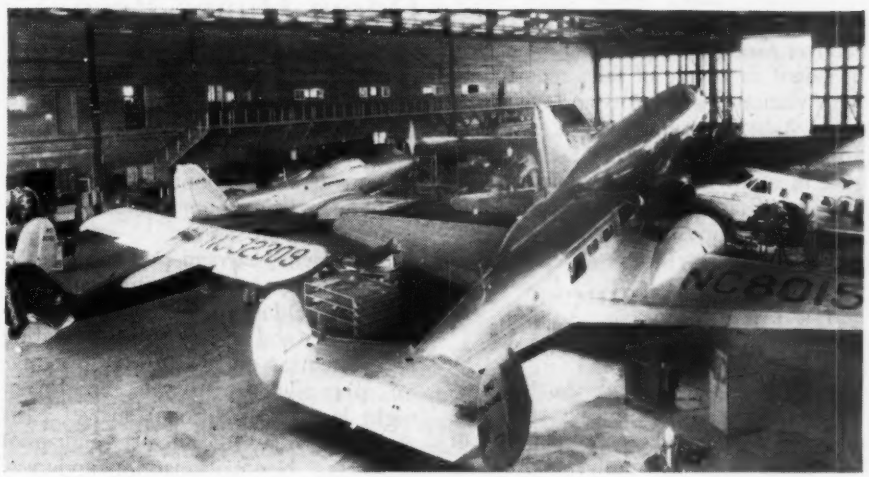
Split-Drum Sander

"Cone-Loc" sander offered by **American Diamond Saw Co.**, 519 N. W. Park Ave., Portland 9, Ore., can be adapted quickly for rough or fine work through use of split drum and interchangeable abrasive cloth in various grits. Aluminum drum-halves have rubber cushions and are locked together with cone type washer. Sander is represented to be light enough for use with a flexible shaft.

Standard width abrasives, available in rolls, are wrapped around drums and secured by pins receding out of way when cone washer is tightened. Maker claims use of abrasives in utility rolls often saves 75 percent over those in "endless belt" form.

Rubber cushion sanders are available in 6¼-12 in.-dia., and in various standard widths and bores. Felt cushion sanders are 6¼ in.-dia.

PLANE-O-TEL, center, is latest business-catcher at SAC. Such ideas have kept . . .



. . . REPAIR HANGARS filled with work that brings annual gross of more than $2 million.

Boom on at Southwest Airmotive

Sharp upswing in executive plane business forces major expansion at Dallas servicing base.

Southwest Airmotive Co., Dallas, Tex., is now rounding out its rapid postwar expansion, gearing the company to do the big job it has cut out for itself in the executive aircraft servicing field.

▶ **Space, Business Growth**—Completion last month of a new 400-by 40-ft. corrugated-steel storage hangar, labeled imaginatively "Executive Plane-O-Tel," brings the impressive layout at SAC to four hangars. There's also a 12,500-sq. ft. warehouse and some outlying buildings, plus 25 spacious acres of concrete ramp across Love Field opposite the airport terminal.

By comparison, a single hangar was headquarters for the entire operation up to less than three years ago. Employment has jumped at Southwest Airmotive from 60 people in 1946 to 170 today. The company has spent more than $125,000 in postwar improvements and more are in view.

Dollar volume reflects SAC's fast growth as one of the country's largest fixed based operators:

• **Gross of $290,000 in 1941** (when the present management took over the now 17-year-old firm) climbed in 1944 to $900,000, including some USAF work.

• **For fiscal 1949,** total sales and service had jumped to $2,100,000, which was in turn about a $900,000 increase over the preceding year.

▶ **Crossroads**—Efficient operation in the service setup, combined with an alert confidence in the future of the executive aircraft industry, appear to be factors in Southwest Airmotive's program.

Typical of SAC's flying customers are the twin-engined planes with the insignia of the noted names in American industry and, more especially, at the strategic Dallas crossroads, the luxurious craft belonging both to independent Texas oilmen and the major oil companies.

Since oil is found all over the vast Southwestern United States as well as to the south in Mexico and South America, flying has long been the logical way to span the distances involved. Southwest Airmotive has counted heavily on the oil industry.

Indeed, the present president of the company and its principal financial backer is Harlan Ray, an oilman.

Last year, SAC's transient service department pumped more than 930,000 gallons of aviation gas, and for the first four months of 1949 the figure is 435,000 gallons.

In a single sample month, 700 planes from 34 states and four South American countries have been counted receiving service at Southwest Airmotive.

▶ **Engine Overhaul Large**—Engine overhaul has become so large a part of the overall operation that the rambling 280-by-150-ft. Hangar 4, has been converted almost entirely to engine shops, with propeller, carburetor and accessory shops adjoining.

Fifty-five men are employed in the engine center alone. About one reconditioned engine a day has been rolling out, mostly Pratt & Whitney R-985 Wasp Jrs., but also the larger R-1830s. Capacity is now being doubled.

SAC does all the engine overhaul on Pioneer Airlines' fleet of nine DC-3s, and Pioneer has a stockroom at one of the hangars. SAC is also a local headquarters and refueling point for Slick Airways' C-46 cargo planes.

The new Plane-O-Tel hangar can store 20 single-engine, or 10 twin-engine planes; has a cleverly devised sheltered parking space for automobiles running the length of its rear side.

At one end of this building is another 120-by-120-ft. hangar, which provides additional plane space, while a pair of two-story office lean-to's flanking this square-shaped structure house administrative offices, transient service and a reception lobby for pilots.

Modification and repairs to aircraft go on in the fourth hangar, 162-by-202-ft., at the other end of the Plane-O-Tel. Radio shop and instrument shop are in the aircraft hangar.

▶ **Flat-Rate Listing**—Illustrative of SAC's streamlined operation is the company's just-issued 62-page two-color "Flat Rate Catalog," listing dollar-and-cents labor costs on all kinds of jobs. Detailed breakdowns, down to items for 50 cents, cover aircraft, engines, accessories, propellers, instruments and radios.

Reflecting Southwest Airmotive's approach to its operation, Winston C. Castleberry, vice-president in charge of

THE
EAGLE
IN THE
EGG

This is a history of the prodigious Air Transport Command. The eagle was still unhatched when we were catapulted into war but its forced growth has changed the whole pattern of world aviation. Oliver LaFarge builds the picture of the organization of this empire of airways, projecting the story to the magnificent record of the Berlin Airlift.

by Oliver LaFarge

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service, describes SAC as being "highly optimistic about the executive airplane because it has proved its utility as a new and valuable tool for industry." But he points out that "constant renovations in technique and equipment" are called for in keeping abreast of the servicing needs.

► **Sales and Promotion Upped**—The company handles lines of about 50 parts manufacturers and is an authorized Pratt & Whitney engine distributor.

In its warehouse, SAC stocks about $250,000 worth of parts. Two SAC flying salesmen go out after business in two company Cessna 120s. Southwest Airmotive is also an authorized Beech aircraft station, and rents offices to the local distributor.

SAC has taken a pioneer step in the direction of getting airlines to buy from distributors rather than direct from manufacturers. Campaigning for such a change, George W. Jalonick III, vice-president in charge of sales reported to the Aviation Distributors and Manufacturers Assn. meetings held at Colorado Springs on his firm's favorable experience in supplying Scintilla magnetos direct to Braniff, Pan American and American Airlines.

Maitland Business Under Expectations

Milwaukee's Maitland Airstrip has been doing so little business that the city may have to take over operation of the field from Skymotive-Milwaukee, Inc., present lessee.

Skymotive has a lease on the field under which it must pay the city 5 percent of gross revenues or $5000 a year, whichever is greater; two cents on each gallon of gasoline sold, and five cents on each gallon of oil.

John P. Henebry, head of Skymotive, has reported losses of $9126.63 for the year ending May 31, and has informed the Milwaukee harbor commission that his firm is in a position where it cannot afford to put more money into the field.

"When we bid for the lease things looked favorable," Henebry said. "We figured at least $100,000 business a year, but we can't keep things going as they are now. We have had fine cooperation from the harbor commission and businessmen; in fact we have received everything but business."

Henebry's report to the commission showed an average of 8.2 landings daily in May; 9.1 in April; 5.3 in March; 3.3 in February, and 2.5 in January. An average of 2100 gal. of gasoline were sold monthly in April and May.

The commission has already spent $205,000 in first stage development on the downtown airport. Plans have been under consideration for added improvements, including a new administration building, modernization of the seaplane ramp and highway improvement.

Hawthorne to Train Pakistan Cadets

Hawthorne Flying Service of Charleston, S. C., has signed another contract with the Pakistan government for advanced training of 20 aviation cadets. The new contract covers the advanced training of the Pakistan cadets who recently completed basic flight training at Hawthorne's Jacksonville, Fla., base. Beginning July 10, the advanced training will be conducted in North American F-51 fighters and will include formation flying, gunnery, photo reconnaissance, and night cross-country work.

Odom Opens Base

Bill Odom, famed Hawaii-N. J. nonstop flyer has publicly opened his new aircraft service facility on northeast corner of Teterboro Airport, N. J. Featured is a modernly appointed restaurant (seating about 50), bar, soda fountain, waiting room and ticket agency for non-sked air service.

A Sherwin-Newman prefab hangar is going up to house maintenance operations. Odom plans to handle Bonanza sales and service and is operating two Bonanzas on charter at 20 cents/mi., plus pilot expenses for initial overnight layover. Additional layover costs client $25/day for aircraft, and pilot expenses. Negotiations are underway to supply flight crews and servicing for corporation executive planes.

New Anti-Knock Lightplane Gas

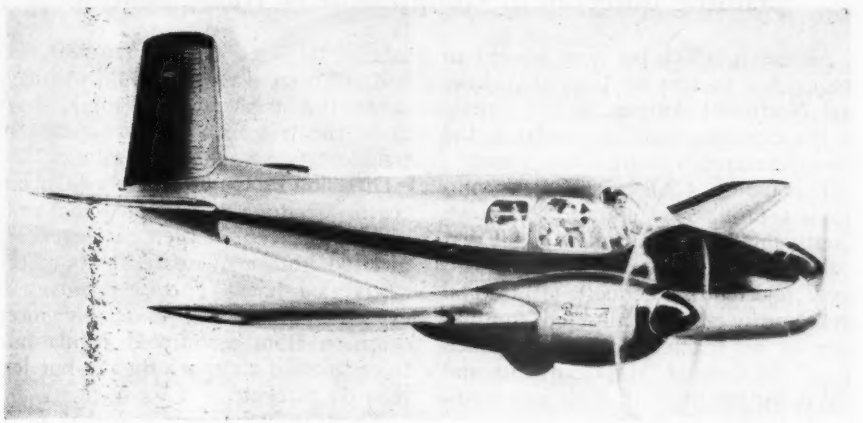
A new personal plane aviation gasoline with controlled takeoff anti-knock rating, has been announced by Standard Oil Co. of Calif.

Previously, the controlled rating was specified only for higher octane airline and military grades of aviation gasoline. Designated Chevron aviation gasoline 80/87, it replaces the former Chevron aviation gasoline 80.

Flashing Position Lights Recommended

Flashing position lights, similar to those used by commercial transports, are recommended by the Civil Aeronautics Administration for private planes flying at night. CAA said it would not make use of the lights compulsory for private pilots. According to CAA, private plane installations are now available for from $4 to $20 and weight from 3 to 20 ounces.

AIR TRANSPORT



NEW PLANE FOR SHORT HAUL proposed by Beech Aircraft Corp. for delivery next year: five-place Model 50 Twin Bonanza, tentatively priced at $30,000, powered by two 185 hp. Continentals.

Feeders Under Pressure to Start

With CAB deadline past, some lines drive for planes, others for mergers, but Parks faces dismemberment.

By Charles Adams

The Civil Aeronautics Board's drive to rid its feeder experiment of deadwood gained momentum as worried holders of certificates for long-dormant short-haul routes tried to protect their investments.

Latest developments:

• **Parks Air Lines**, East St. Louis, Ill., which was awarded the largest feeder network, is in danger of being carved up.

CAB has reopened the North Central, Great Lakes and Mississippi Valley area cases—wherein Parks was granted more than 4000 miles of routes in 1946 and 1947.

As a result, eleven carriers have filed for parts or all of Parks' system. The applicants include Braniff Airways, Continental Air Lines, Delta Air Lines, Eastern Air Lines, Mid-Continent Airlines, United Air Lines, Wisconsin Central Airlines, Central Airlines, Oklahoma City; Ozark Air Lines, Springfield, Mo.; Nationwide Air Transport Service, Inc., Miami Springs, Fla.; and Southern Bus Lines, Alexandria, La.

• **Arizona Airways, Inc.**, Phoenix, which like Parks was ordered by CAB to start service by July 1 or face possible loss of its certificate, has announced a merger arrangement with Monarch Air Lines, Denver. The pact provides that, if CAB approves, Arizona's stockholders will receive 6000 shares of Monarch stock in exchange for all the issued and outstanding shares of Arizona.

Designated by CAB for a certificate in February, 1948, Arizona Airways had difficulty raising money for inauguration of service. Monarch has been an active feederline since November, 1946.

• **Lightplane plans** of Central Airlines, Oklahoma City; and Iowa Airplane Co., Des Moines, apparently are making excellent progress. Both carriers expect to start single-engine feeder service before fall (AVIATION WEEK, June 20).

More than two months ago (after being warned by CAB to get started) Parks Air Lines sought to solve its difficulties by merger. It asked the Board to approve an agreement whereby Mid-Continent Airlines, through an exchange of stock, would take over PAL as a wholly-owned subsidiary.

► **Protests Filed**—A number of trunklines, including United, Eastern, Braniff and Chicago & Southern, immediately protested they would suffer if the MCA-Parks merger were approved. They expressed doubt that Parks is still "fit, willing and able" to operate the services for which it was certificated.

Eastern said "evidently the proposed acquisition of Parks by Mid-Continent was presented as a last-minute, desperate attempt to salvage the Parks certificate, since CAB in March designated July 1 as the deadline for inauguration of Parks' service."

Chicago & Southern claimed the Midwestern area in which Parks is certificated has adequate surface transportation and does not need feeder airline service.

► **Fitness Challenged**—Ozark Air Lines, Springfield, Mo., an unsuccessful applicant for the routes awarded Parks in the Mississippi Valley area case, declared flatly that PAL is no longer fit, willing and able to conduct the service authorized. Ozark was recommended for a certificate by a CAB examiner, but the Board finally selected Parks because of the latter's extensive fixed-base experience and facilities, and because of a Board desire to experiment with a "super-feederline" twice as large as most short-haul carriers.

According to Ozark, Parks has now sold most of the fixed-base operations it had when applying for the feeder system. Ozark said Parks' net worth has been cut considerably by losses sustained in curtailing training operations. In addition, Ozark declared, Parks Air College, with a net worth of $600,000, was given to St. Louis University.

Ozark, which already has been found fit, willing and able by CAB, has indicated that if it is given Parks' routes it will operate them with lightplanes.

► **Merger Is Alternative**—The Mid-Continent-Parks merger proposal will be considered by CAB as an alternative to giving Parks' system in whole or part to Ozark or others among the eleven applicants. Hearing is tentatively scheduled for Sept. 26.

MCA and Parks strenuously opposed the opening of new possibilities for disposition of the PAL feeder system. They said that activation of Parks routes could be accomplished "almost immediately" after approval of the merger pact.

► **Action on Arizona**—CAB's action broadening the possibilities for disposition of Parks' system may be repeated in the case of Arizona Airways. When the Board originally selected Arizona over other applicants to operate more than 1000 miles of feeder routes, it made the award contingent on a showing of an adequate financial structure.

The Arizona Airways-Monarch merger is complicated by the fact that the two systems are not now connected. Mid-Continent and Parks, on the other hand, have several common terminal points. Arizona and Monarch would ask CAB for a connecting link if their merger is approved.

► **Single-Engine Operations**—Meanwhile, Central Airlines expects early CAB approval of proposed changes in company control and of new interlocking directorates. The Oklahoma City carrier believes it can activate its entire 1300-mile system with lightplanes 60 days after CAB approves the new corporate setup.

Central already has contacted manufacturers on the purchase of suitable single-engine equipment (Navions, Cessnas or Beech Bonanzas). It also has conducted preliminary negotiations on

airport operating rights and the setting up of repair facilities.

"A great deal of work has been done on writing operating manuals for single-engine aircraft in cooperation with CAA's fourth regional office," according to Keith Kahle, Central's vice president and general manager. "But we can't make definite commitments until CAB approves the change in control and interlocking directorates."

▶ **Cessnas Purchased**—Iowa Airplane Co., Des Moines, another inactive feeder ordered to start operations by July 1, is speeding plans for inaugurating lightplane service in August or September. The carrier has contracted for seven Cessna 190s contingent on their being able to meet the new Civil Air Regulations governing scheduled operations with lightplanes.

IAC, which plans to change its name to Mid-West Airlines, reports it has all necessary personnel under contract. Most of the required landing rights have also been obtained.

UAL Maps

New maps that graphically simulate the colors and contours of the earth as it appears from high altitudes have been prepared for United Air Lines' passengers so they can identify accurately all major landmarks below.

The maps, contained in a 16-page booklet in seat pockets of all UAL planes, cover the company's entire 10,700-mile system. Six double-page charts depict domestic routes, and a one-page chart shows the Hawaiian Islands.

CAB Still Wary of Air Coach

Board extends some cut-rate fares for two months, pending outcome of comprehensive traffic analysis.

Air coach, which has been labeled an unqualified success by Capital Airlines and Northwest Airlines, is still strictly in the experimental class insofar as the Civil Aeronautics Board is concerned.

This month, CAB extended the tourist-class tariffs of Capital, Northwest, Continental, Mid-Continent and TWA from July 31 to Sept. 30. But the Board flatly rejected the requests of Capital and Northwest for unlimited continuance of air coach services and turned down the bids of Mid-Continent and TWA for extension of their four-cents-a-mile tariffs into 1950.

▶ **Study Being Made**—CAB extended air coach services for only two months because it will soon have available a comprehensive traffic analysis which will have an important effect on the federal agency's next move in the cut-rate air transport field.

Study of the first-of-the-week family fare plan, which also expires Sept. 30, is being made at the same time.

During May, the Board distributed thousands of questionnaires on the certificated airlines coach and regular-fare schedules, asking passengers if they were making their first trip, what was the purpose of the flight, and how many trips they make by air or surface in a year.

Air coach passengers were also asked: "If this coach transportation had not been available, would you have made this trip? If you would have made the trip anyway, what means of transportation would you have used?"

▶ **Diversion Problem**—Nonscheduled air-coach operators have claimed that only about 10 percent of their passengers are diverted from regular-fare flights of the certificated lines. The CAB survey is expected to show considerably more diversion from certificated regular-fare to certificated air coach flights—but less than 50 percent.

There is little likelihood that CAB will order discontinuance of all certificated air coach schedules following Sept. 30.

The Board's principal objective is to determine how much four-cents-a-mile service should be permitted—and under what circumstances. CAB has authorized no new coach services on the certificated airlines for several months awaiting the outcome of its traffic studies.

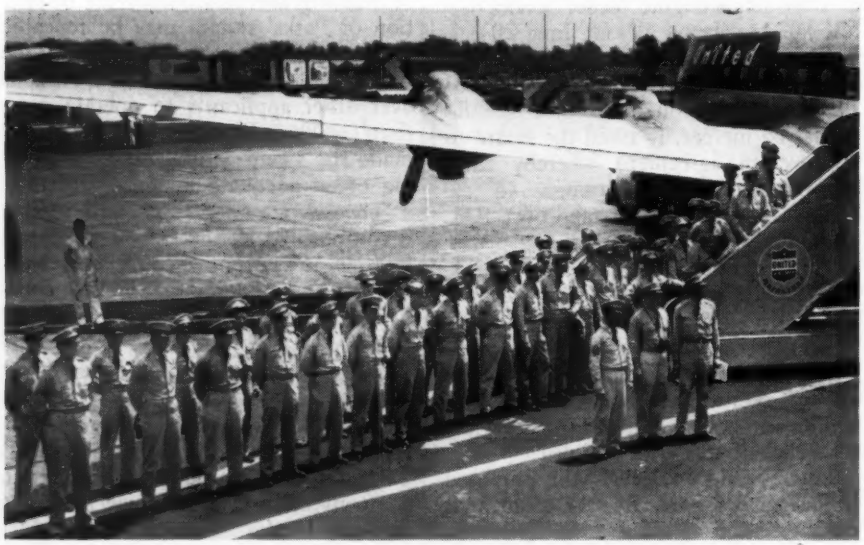
▶ **Capital Reports Progress**—Even Capital Airlines, pioneer in scheduled domestic air coach, thinks that great harm would result if substantially all certificated airline fares were cut from six to four cents a mile. Further, Capital believes that coach flights should be restricted to late-night departures with high-capacity planes so that the service differs materially from that offered at six cents a mile.

While it favors "controlled" air coach, Capital's enthusiasms for its tourist-class service continues to grow. During June it rang up an 85 percent passenger load factor on its "Nighthawk" flights—the best showing it has yet made.

▶ **Few Cancellations**—Performance factor of the "Nighthawk" flights was 100 percent in June and has been either 99 or 100 percent in the past four months.

Passenger load factor on Capital's New York-Chicago air coach run—started last No. 4—rose from 69 percent in March to 82.5 percent in April, 87 percent in May and 92 percent in June. On the Washington-Chicago coach run—started Apr. 1—passenger load factors were 75 percent in April, 79 percent in May and 87.5 percent in June.

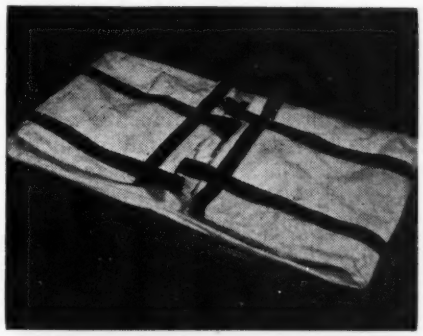
Capital's New York-Twin Cities "Nighthawk" service—inaugurated Mar. 24—showed a 64.5 percent passenger load factor in April, 70.5 percent in May and 81.5 percent in June. From Nov. 4 through June 30, the company carried 68,607 coach passengers.



ARMY RIDES THE AIRLINES

The certificated airlines' newly-effective 10 percent fare discount for authorized travel by military personnel is expected to make this kind of scene lose its novelty. A group of Army Transportation Corps specialists is shown above at Chicago en route from Fort Eustis, Va. to Fort Lawton, Wash., via a special United Air Lines flight. Through the 10 percent discount (Aviation Week, July 4), the Domestic Airlines hope to increase their share of military transportation business (which totals $100 million annually) from the present two percent to about 10 percent.

CARGO CONTAINER holds 450 lb. loaded . . .



. . . FOLDS DOWN TO about 1½ inches

Collapsible Container Aids Cargo Carriers

One of the newest items aimed at speeding-up air-freight operations is a collapsible container designed to permit full loading of a cargo plane in 15-20 minutes under favorable conditions.

Developed by cargo tie-down expert Frank Davis, the container has a 20 cu. ft. capacity, will carry a maximum of 450 lb. and is designed to be handled by one or two men. It is manufactured under contract with Davis by Air Associates Inc., Teterboro, N. J.

Made of reinforced canvas with a plywood base, unit has two web-loop handles at the ends for carrying. For rough treatment, a 5-inch scuff band is sewed around the bottom edge, overlapped by a 1-inch aluminum angle which is riveted to the plywood. A zipper flap running around the top completely encloses and secures packages, placed in unit. Dimensions when fully loaded are 2 x 4 x 2½ ft. When empty, container collapses into a 1½-in. plate weighing 22 lb.

▶**Eight Together**—For very large loads which should be together, eight of these containers can be sub-loaded and lashed to a pallet, built for this purpose by Air Associates. Pallet measures 4 x 8ft. and when fully loaded (20 cu. ft. containers in two tiers), is 5 ft. high. It is ruggedly built and has five wide casters on each side which fit into recessed channels in most cargo plane floors. It also can be used for carrying a large aircraft engine.

According to Davis, seven of these units, carrying a total of 56 containers, can be loaded on a C-54. Each pallet in this plane, he points out, would have a floor weight area capable of 4800 lb.

▶**Lifting**—A fully-loaded pallet can be placed in a plane by inserting the forks of a lift truck under one of the narrow ends of the unit, and then securing the load with ¼-inch rod or cable running from the top of the fork-lift column to the outer bottom edge of the pallet.

The complete unit is then lifted into the aircraft and aligned with caster grooves on the floor. A winch located aft of the pilot's compartment pulls the load forward into position.

Tighter Safety Rules For Intrastate Lines

Uncertificated intrastate airlines operating on a scheduled basis soon may be required to observe exactly the same safety rules that apply to certificated interstate carriers.

This proposed stiffening of the intrastate carriers' safety standards followed vigorous protests against activities of uncertificated operators making cut-rate flights in California—especially on the Los Angeles-San Francisco route (Aviation Week, July 18).

Although Civil Aeronautics Board officials discounted many of the charges made against the California independents, they said the same level of safety should apply to comparable operations, whether intrastate or interstate.

CAB noted that some of the scheduled intrastate operators fly between large cities over the same airways and into the same airports with the same type of equipment as the certificated airlines.

▶**Part 45 Rules**—At present, the California independents operate under a new Part 45 of the Civil Air Regulations which became effective June 1. Part 45 provides that interstate contract carriers and scheduled intrastate operators using transport-type equipment must observe the same safety rules that govern large nonscheduled airlines engaged in interstate transportation.

These requirements for large irregular operators flying interstate routes are in Part 42 of the Civil Air Regulations. According to CAB, the nonsked standards in Part 42 "are as close to those specified for scheduled certificated lines as the inherent differences of the two types of services permit."

▶**Differences Eliminated**—But CAB now intends to wipe out all differences in safety rules between scheduled interstate and scheduled intrastate operators. Thus it is proposing that the uncertificated intrastate carriers must conform not to the safety standards applying to large interstate nonskeds in Part 42 but to those in Parts 40 and 61, which govern the certificated airlines.

AA Converts DC-4s, But Not for Coach

American Airlines has no present plans to go into the air coach field, according to President C. R. Smith.

Asked about three combination passenger-cargo DC-4s now being modified by Aviation Maintenance Corp., Van Nuys, Calif., Smith said his company has not yet decided to put these planes into scheduled service either as freighters or passenger planes. As air-coaches, the craft could seat 74 persons.

"If freight business continues to increase, these three combination planes may later be put into scheduled cargo service," Smith explained. "If there should later be a requirement for high-density passenger (air coach) service, the planes will be available."

American still owns 26 DC-4s which were retired from domestic passenger service. Of these, 14 are in regular AA cargo service and another is being converted as an airfreighter. Six DC-4s are up for sale, and two others now leased to American Overseas Airlines will be surplus when turned back to AA.

CAA Suspends Nonsked Certificate

The Civil Aeronautics Administrator has suspended the operating certificate of Strato-Freight, Inc., the nonscheduled carrier whose C-46 crashed in the ocean off San Juan, Puerto Rico, last month, killing 53 of the 81 persons aboard.

CAA said the company, which operates from Teterboro, N. J., and Windsor Locks, Conn., had "by the pattern of its violations manifested an attitude of indifference for the safety of others and a disregard for the Civil Air Regulations." The Civil Aeronautics Board has been asked to revoke the carrier's operating rights permanently.

▶**Violations Listed**—The formal complaint made by CAA against Strato-Freight charged the company with a long list of safety violations during the past year. CAA alleged that on June 5, just prior to the Puerto Rican accident, the carrier knowingly flew its C-46 from Newark to Miami "with the flap follow-

up cable in a frayed and weakened condition."

The plane was then flown from Miami to San Juan although the company knew the cable had broken, CAA declared. Whether the cable was repaired in San Juan prior to the fatal flight back to Miami was not stated.

▶ **Insufficient Life Rafts** – CAA also charged formally that the aircraft which crashed last month was overloaded and had insufficient life rafts for all persons aboard. The complaint added that Strato-Freight had not established procedures for familiarizing passengers with the location and use of emergency exits.

In flights prior to the fatal accident, CAA said Strato-Freight had used its pilots in excess of flight time limitations, made improper entries in flight manifest records by incorrectly stating weight and balance data, and operated a plane over 100 hours without an inspection. In September, 1948, and again in January, 1949, Strato-Freight reportedly compromised a civil penalty by paying $250 for alleged violations of the Civil Air Regulations and Civil Aeronautics Act.

The Puerto Rican government has ordered that all persons allegedly responsible for the Strato-Freight accident go on trial Aug. 8 in San Juan district court.

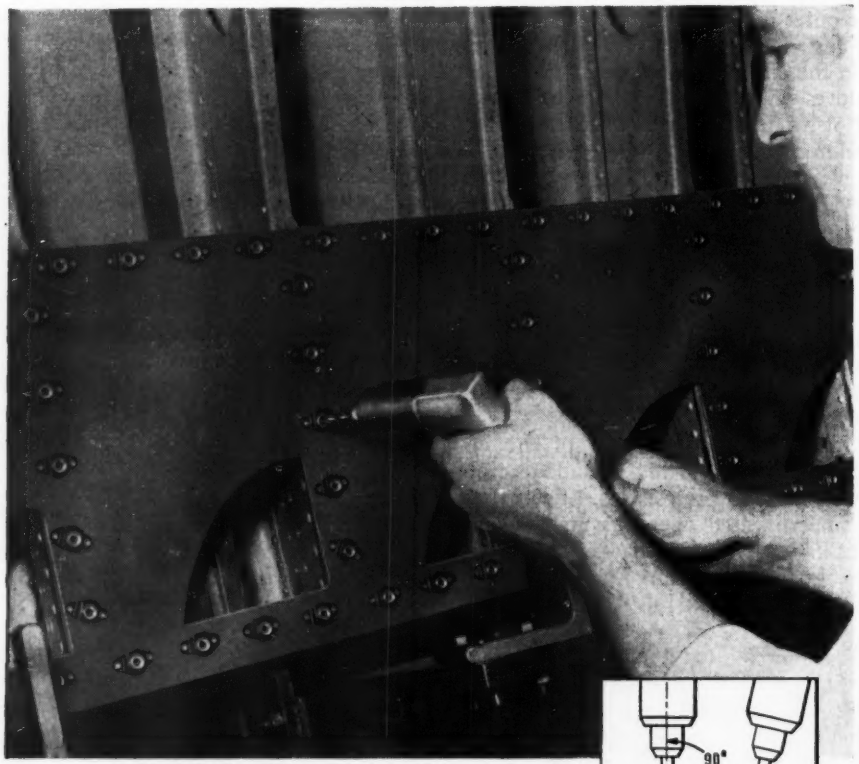
Committee Approves Mail Appropriation

Legislation carrying $20,402,000 for domestic and foreign airmail payments required to meet rate increases awarded by the Civil Aeronautics Board, has been approved by the House Appropriations Committee.

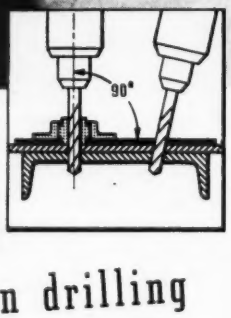
The appropriation is allocated:

▶ **Domestic Airmail**—$16.1 million for the 1949 fiscal year; $3,201,000 for the 1948 fiscal year. Irate over CAB's action in making mail pay grants to cover airline losses for plane groundings and its failure to disclose the subsidy element in its mail pay awards, the Senate Appropriations Committee a month ago refused to approve the $16.1 million additional for domestic mail pay for the 1949 fiscal year despite the testimony of Post Office officials that the department was completely without funds to make payments to carriers.

The action was intended mainly as pressure for legislation directing a separation of service and subsidy payments to airlines. The Senate is expected to go along with the House this time and approve the funds, since the Post Office is legally obligated to make payments to carriers at rates set by CAB.



Anchor Bushing drill template in use at Ryan Aeronautical Company, San Diego, California.



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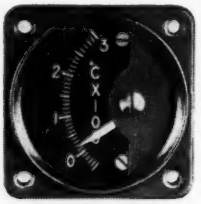

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► **Foreign Airmail**—$1,101,000 more for the 1948 fiscal year. In February, the Post Office estimated that rate increases ordered by CAB would require an additional $6,414,169, but it has now developed that $7,515,169 will be necessary. This will go to: Pan American Airways, New York-Europe-Africa-Asia route, $5,165,469; American Overseas Airlines, New York-Europe, $1,612,050; Panagra, Balboa-Buenos Aires, $719,750; National Airlines, Miami-Tampa-Havana, $17,900.

The $16.1 million supplemental will boost the total outlay for domestic airmail for the 1949 fiscal year to a record $63,501,000. The $3,201,000 additional will boost the outlay for 1948 fiscal year domestic airmail to $50,201,000.

Miami Expanding International Airport

Miami International Airport expects to start work on a $9 million improvement and enlargement program within 90 days.

The project will include addition of 12,000 sq. ft. of floor space to the present terminal building and construction of a new terminal and hotel within 24 months. Runways and taxiways will be improved and lengthened, and additional maintenance areas will be provided.

► **Claims First Rank**—Valued at $30 million, Miami International Airport claims first rank in the nation in: number of international passengers arriving and departing, number of flights completed without interference of weather, number of employes, and size of maintenance and overhaul facilities for commercial aircraft.

Three hundred and twenty-four buildings, including four passenger terminals, are in the approximately 2500 acres of airport area. Twelve scheduled and 34 nonscheduled airlines use the field, and more than 15,000 persons are employed there with a total annual payroll of over $56 million.

U. S. port of entry records for international airline passengers show that during fiscal 1946, 1947 and 1948, 47.12 percent originated, terminated or passed through Miami International Airport; New York accounted for 32.26 percent; and all other U. S. airports, 20.62 percent.

HAS Delays

Inauguration of helicopter mail service in Chicago has been postponed from July 23 to Aug. 20 because of a strike at Bell Aircraft Corp.'s Buffalo, N. Y., plant.

Helicopter Air Service, Inc., Northbrook, Ill., which was certificated for the

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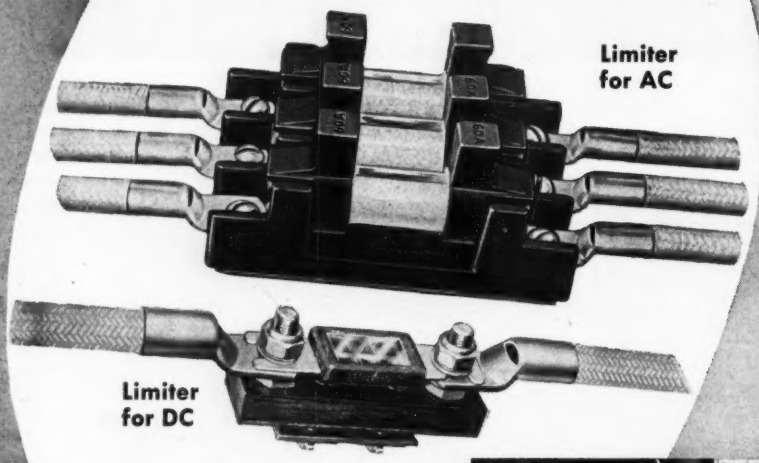
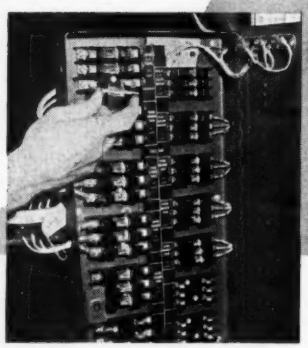


BURNDY
Aircraft Limiters



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operation last November, said it did not want to start up until it can be assured of Bell's full service and parts facilities. HAS plans to use six Bell 47D-1 helicopters when in full operation.

Trial runs with Bell 47D-1s over a shuttle route between the Chicago Municipal Airport and the roof of the main post office building in downtown Chicago were being made early this month.

▶ **Suburban Routes** — The company hoped to inaugurate the first of its three circular suburban routes on Aug. 8 with service to the towns of Berwyn, Maywood/Oak Park, Park Ridge, Glenview, Evanston, Wilmette, Winnetka, Glencoe, Highland Park, Lake Forest, Waukegan, Libertyville, Barrington, Palatine, Arlington Heights and Des Plaines.

A western loop to open later includes La Grange, Elmhurst, Villa Park, Glen Elyn, Wheaton, West Chicago, Elgin, Geneva/St. Charles, Batavia, Aurora, Naperville, Downers Grove and Hinsdale.

The third and southern suburban route was to open Sept. 6, serving Blue Island, Harvey, Whiting, East Chicago, Gary, Hammond, Lansing, Chicago Heights, Joliet, Lockport, Lemont and Argo.

▶ **Airport Is Hub**—Each of the suburban routes starts and ends at Chicago Municipal Airport. Three flights daily are planned over the circular links. Schedules have been planned to give the outlying towns virtually the same quick air mail delivery the Chicago Loop now enjoys.

Towns not on the initial routes may be added later. Volume of incoming and outgoing air mail will determine whether all towns on the three routes will receive service permanently.

UAL Reports Prop Reversal in the Air

Another instance of unintentional reversing of propeller pitch in flight has been reported by a domestic airline.

Most recent case involved a United Air Lines DC-6 on final approach for a landing at Ypsilanti, Mich. At an altitude of about 75 feet throttles were moved rearward—and all four propellers went into reverse.

▶ **Safe Landing**—The throttles were advanced immediately. Although airspeed decreased rapidly and the plane settled fast, a quick recovery was made and the landing was normal.

A check disclosed a safety switch stud that actuates the microswitch on the nose gear was missing. Switch and stud were checked prior to takeoff at Chicago by the flight engineer and were normal at that time. UAL reportedly is considering the addition of a lock washer under the jam nut of the stud.

Prior to the UAL incident, an American Airlines Convair-Liner's propellers reversed pitch while on final approach at Newark (AVIATION WEEK, June 6).

SHORTLINES

▶ **American**—Expects an additional $2 million in passenger business annually as a result of the 10 percent discount offered by AA and other domestic airlines for authorized military travel (AVIATION WEEK, July 4). . . . During their first year of service ending June 1, company's Convair-Liners carried 1,032,000 passengers 265,900,000 revenue passenger miles.

▶ **Braniff**—Has announced seven- and 14-day all-expense tours from its Houston gateway to Rio de Janeiro. Rates of $1011 and $1250 include roundtrip DC-6 transportation, hotel accommodations and side trips in Brazil.

▶ **BOAC**—Company's $93.70 reduction in round-the-world fares applies only to flights made via Australasia (AVIATION WEEK, June 27). New round-the-world tariff via Australasia is $1886 compared to $1700 via the shorter mid-Pacific route.

▶ **Canadian Pacific**—Has inaugurated fortnightly service between Vancouver, Canada, and Sydney, Australia, with 38-passenger Canadair Fours. CPA hopes to inaugurate in August a weekly trans-Pacific run to Hong Kong via the Aleutians. Company now has four Canadair Fours, taking delivery on its last plane five months ahead of schedule.

▶ **Capital**—Reported record airfreight business during second quarter 1949, with revenue up 51 percent and ton mileage up 62 percent over the same quarter last year. Efforts by business firms to keep inventories low as a guard against losses from lower prices were seen as a major factor in boosting airfreight. . . . A CAB examiner has recommended Capital be permitted to serve Newport News, Va., as an intermediate point between Washington and Norfolk.

▶ **Colonial**—Has made a contract with Airwork Corp., Millville, N. J., to do all of the carrier's Pratt & Whitney engine overhaul. . . . Capt. G. R. Janas, formerly chief pilot, has become director of flight operations and assistant to the vice president-operations. Capt. M. B. Woodworth, Jr., is the new chief pilot. . . . Company is offering special summer "package" tours to Bermuda for as little as $170.

▶ **National**—Broke all passenger traffic records on July 1. June business was the best for that month since the war.

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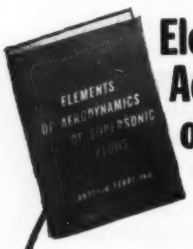

Elements of Aerodynamics of Supersonic Flows

by Antonio Ferri
Chief of Gas Dynamics Section, Langley Field

The first comprehensive, up-to-date, authoritative explanation of the engineering applications of supersonic theory, this new book provides specific guidance on such matters as the design of supersonic wings, instruments, wind tunnels and other aspects of the development and testing of high-speed aircraft and projectiles. Dr. Klemin, in his unqualified recommendation of the book, says: "Mr. Ferri makes the mathematics perfectly clear; the physical discussion, fascinating. This combination of sound mathematics and physical realities makes his book invaluable."

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► **Northwest**—Preliminary estimates indicate the company will show an operating profit for the first six months of 1949. June revenues of $4.1 million were the highest in NWA history. Company lost over $2 million in the first half of 1948.

► **Piedmont**—Carried 8392 passengers in June against 4046 in the same month last year.

► **Scandinavian Airlines System**—During June filled 1866 out of 1872 seats on its trans-Atlantic flights for a 99.6 percent load factor. Passengers numbered 1362 in the same month last year.

► **Southwest**—Company's 52 percent load factor in June is believed to be new high for the feeder industry. SWA's 45 percent load factor in May topped all other short-haul carriers.

► **TWA**—Broke all company traffic records in June, flying 101,740,000 revenue passenger miles domestically and 30,424,477 internationally. Passenger load factor was 74 percent domestically and 70.4 percent on international flights.

► **United**—Reported its best on-time performance during June of about 5500 flights, 95 percent departed on time or within 15 minutes of schedule, and 80 percent arrived at final destinations on schedule or within 15 minutes. Showing was a 47 percent improvement over June, 1948.

► **Western**—Has reapplied to CAB for an extension of its routes from Yuma to Phoenix, Ariz. Company has canceled its contract with Arizona Airways which would have transfered WAL's San Diego-El Centro-Yuma route to the feeder.

CAB SCHEDULE

July 25—Prehearing conference on CAB's investigation of U. S.-Hawaii tariffs. (Docket 3762)

July 26—Prehearing conference in Monarch-Arizona Airways merger case. (Docket 3977)

Aug. 1—Hearing on renewal of Southwest Airways' feeder certificate and suspension of United Air Lines' service at four California points. Postponed from July 25. (Dockets 3718 and 3867).

Aug. 1—Prehearing conference in air freight rate investigation. (Docket 1705)

Aug. 8—Hearing on Cargo Air Service's lightplane route application. (Docket 3629)

Aug. 15—Hearing on Hughes Tool Co. control of TWA. (Docket 2796)

Aug. 22—Hearing on extension of Expreso Aereo Interamericano's Havana-Miami foreign air carrier permit. (Docket 3717)

Sept. 6—Hearing on service to Lake Tahoe. (Docket 3623)

Sept. 12—Hearing on CAB investigation of International Air Transport Assn. agency resolutions. (Docket 3350)

Sept. 26—Hearing on Seaboard & Western and Transocean Air Lines applications for all-cargo certificates between the U. S., Europe and the Middle East. (Dockets 3041 and 3818)

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RG41U	67.5 ohms	575.00
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RG54AU	58.0 ohms	75.00
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Hail and Farewell!

A FINAL REPORT on the Steward-Davis R-1830-92 Conversion:

The last Steward-Davis 100-Hour warranted R-1830-92 Conversion was produced by this company on May 15th, 1949.

The primary reason for discontinuing the production of such conversions is that the surplus market supply of zero-time R-1830-65 or 43 engines in condition to permit safe and economical conversion is so limited that Steward-Davis considers it no longer practical to continue offering conversions for sale.

However, we announce with pleasure that the second, and the conclusive reason, for the removal of conversions from our sales lists is that we are now able to offer the Steward-Davis 600-Hour warranted Commercial Overhaul to our customers at $1895 on one year contract*. At this price we do not feel that the Steward-Davis 100-hour warranted Conversion could compete with its successor, regardless of any changes in surplus supply.

*600-hours subject to customers observance of U.S.CAA maintenance and operations standards. $2125 on individual exchange purchase.

We wish to extend our grateful thanks to all of the many customers who purchased and flew the Steward-Davis R-1830-92 Conversion, and whose cooperation made the following service record possible.

Conversions produced: **349**

Percent of engines suffering major failures: less than **1%**

Total of all difficulties reported: **11**

Minor: **8**

Minor difficulties repairable without removal of engine from aircraft or involving only accessories.

Major: **3**

Percent of engines suffering difficulties within 100-hour warranted period: **1.43%**

Percent of difficulties compensated for occurring within 100-hour warranted period: **100%**

Percent of engines suffering difficulties outside 100-hour warranted period: **1.72%**

Percent of difficulties compensated for occurring outside 100-hour warranted period: **80%***

*decision pending on 1 failure, compensation for which would make a total of 100%.

COMPLETE ITEMIZED REPORT AVAILABLE UPON REQUEST

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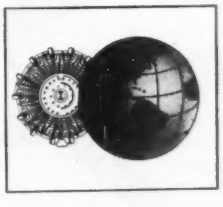

exclusively overhauling Pratt & Whitney R-1830-92's

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R 1830-92 CONVERSION

$1875.00 *Exchange f.o.b. Miami*

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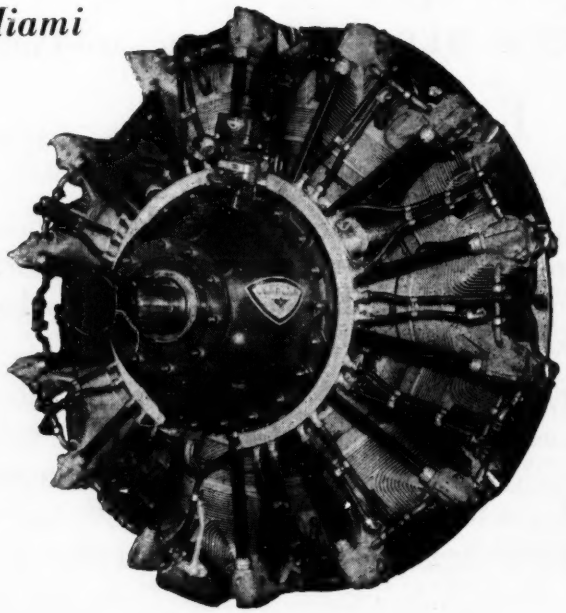
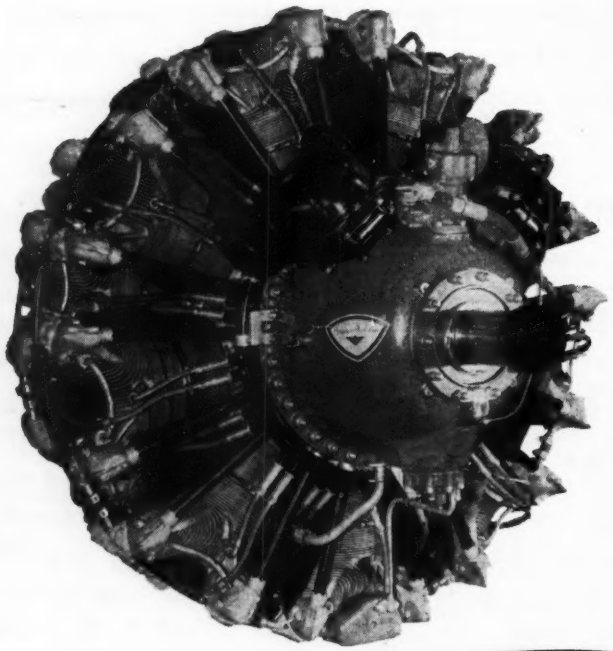
No time since service overhaul . . .
Power section thoroughly inspected by experienced and qualified personnel . . .
Blower section completely overhauled in our C.A.A. APPROVED shop . . .
Carburetor overhauled . . .
Buta Diene diaphragms installed, and flow bench tested to manufacturers specifications . . . Engine, block tested . . .
Magnetos, Harness and Spark Plugs included . . . Form 337 supplied . . .
Boxed for long time storage or export . . .





R-2800-51

$2250.00 *Exchange f.o.b. Miami*

. . . Zero time since service overhaul . . .
Carburetor overhauled and flow bench checked to manufacturers specifications . . . Engine Block Tested

Magnetos, Harness, Spark Plugs and Form 337 supplied . . .
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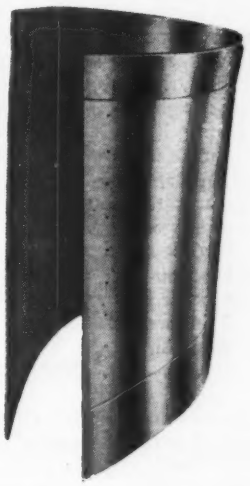

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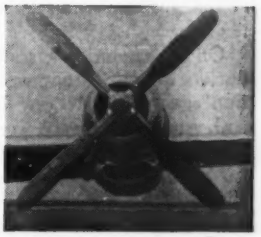

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LETTERS

Used in War College

Your magazine is being used as a guide in current air power thought more each week. Particularly, your issue of May 16. That copy left my hands about one hour after I received it and it was three days before I received it back. It has been through at least 11 interested War College students. . . .

A USAF Base Commanding Officer

Skimming the Cream?

As a reader suffering from myopic astigmatism, I rebelled a bit at the fine-print of your June 27 editorial, "Air Transport Should Grow Up."

But as one who cherishes continued betterment of the aeronautical breed, I can only shout "bravo" over what you had to say.

So this letter is by way of being a postscript to your own reply to handsome Bob Six and hearty Jerry Land.

In the first instance, let me put Bob Six straight on the "cheap labor" employed by Aircoach operators. Air America pays its DC-4 captains a straight $12 per hour—an amount appreciably higher than the going rate on Continental and more than Jerry Land would suggest to his Air Transport Association membership.

Moreover, Air America captains need not mark time in deference to over-loaded seniority lists. They average better than 65 hours of flying every month—even though Air America operates a maximum of 12 trips per month under provisions of its irregular exemption. In addition, Air America captains draw $7.20 in tax-free per diem for expenses away from domicile to give them an average of approximately $10,000 yearly.

Air America copilots are paid a straight monthly salary of $300 during their first six months with the company; $350 for their second six months. After a year, they are expected to qualify as captains—and usually do. They also draw $7.20 daily for expenses.

Cabin attendants, too, are paid no less than their colleagues on the scheduled airlines. They start at $200, usually rise to $225 within three months. With $7.20 in per diem added on to these wages, most Air America stewardesses gross $65 a week—regularly.

On the ground, pay scales are equally conducive to low turnover in personnel. Station agents, dispatchers, load control clerks, and senior clerical workers earn $250 monthly. Ticket agents are paid from $200 to $300 monthly depending upon living costs in their base cities. Ticket office managers are paid 20 percent more.

There is one point of truth in Bob Six's reference to lower payroll costs. Air America has fewer—and less expensive—executives than any comparable air operation in the United States. It is this general economy on indirect or non-flying functions that permits Air America to pay more than the regular airline rate for pilots, gas, oil, insurance, maintenance, ground service, and general safety while operating profitably on 4 cents per mile fares.

In conclusion, let me take one more poke at the "cream of the market" fallacy that insists the non-skeds would lose their shirts on anything but New York-Los Angeles passengers.

During the month of May, 40 percent of Air America's net profit came from the short-haul Los Angeles-San Francisco and Chicago-New York passengers. An additional 20 percent of the net came from Chicago-Los Angeles business. The remaining 40 percent of net was traceable to New York-California traffic, excess baggage revenues, charter and group movements, and miscellaneous income from equipment leases, earned discounts, etc.

Meanwhile, two other non-members of the Air Transport Assn. were carrying 14,000 passengers on the Los Angeles-San Francisco shuttle—according to the in-and-out records at Lockheed Air Terminal.

If the non-skeds are skimming any cream, that cream represents a large segment of the population that had gone sour on air travel because they could not afford 6 cent fares and the luxury of flying in half-empty airplanes.

To explain the profit of Air America, I would suggest that Admiral Land study our manifests rather than our cost sheets. Simple arithmetic suggests that 67 seats occupied at $100 apiece will deliver a greater profit than 20 or 25 seats occupied at $157. Or—if we consider a short-haul operation—72 seats occupied at $10 on the San Francisco-Los Angeles route will pay a greater return than 20 seats occupied at $21.

But, perhaps ATA members who prefer the paternalism of Uncle Sam to the patronage of Uncle Sam's nephews don't want this yardstick? We at Air America believe that commercial aviation, now celebrating its thirtieth birthday, is old enough to lay aside the swaddling cloth of subsidy and earn its own living.

Paul Andrews, President
Wilson-Andrews Adv. Corp.
407 Commercial Center St.
Beverly Hills, Calif.

Pre-Stall Warnings

Mr. Chapman's recent letter to you (Aviation Week June 20) requested evidence as to the ability of stall warning indicators to prevent stall accidents.

He is evidently under the misunderstanding that when the stall alarm sounds it is too late to do anything about it. The Safe Flight pre-stall warning indicator signals the approach of an impending stall in ample time to take normal preventive action. In fact, the pre-stall margin is adjustable and may be made as far in advance of the stall as is necessary.

The Safe Flight pre-stall indicator has set a perfect record in eliminating fatal stall accidents from more than 5000 airplanes over a period of 2 years. Since there are normally an average of 37 fatal stall accidents from this number of airplanes each year, there are many people who owe their lives to not being as skeptical as Mr. Chapman regarding the value of stall instrumentation.

We recently made a survey of 500 owners of SFI- equipped airplanes. The results of this survey were submitted by the Aircraft Owners and Pilots Assn. to the members of the Congressional Committee on Air Safety. A tabulation of the results are as follows:

- 96 percent stated that the SFI added to confidence and flying pleasure.
- 78 percent stated that it had improved the pilot's stall perception.
- 60 percent stated that it had warned against an inadvertent stall.

To obtain more information concerning the latter group, those who stated that an inadvertent stall accident had been prevented, we sent a full page questionnaire form to cover the complete details. These returned questionnaires gave detailed descriptions of incidents where the instrument warned of an inadvertent stall which, in the opinion of the pilot, might have resulted in an accident.

In testimony of the Safe Flight Indicator's record, five aviation insurance underwriters now grant a specific reduction in crash insurance rates when an aircraft is equipped with an SFI.

Leonard M. Greene, President
Safe Flight Instrument Corp.
21 Russell Street
White Plains, N. Y.

Practical Roadable

I thought you might be interested in a stunt which involved my roadable Ercoupe. Mrs. Gladys Pennington and Ellen Gilmour of Miami entered the All Women Race June 1 from Montreal, Canada, to Miami, and after flying to Jacksonville, Fla., folded the wings and drove down the highway to Daytona a little more than 100 miles and flew on to Miami the next morning.

They had to discontinue driving a little past midnight because the headlights exhausted the battery (which is not charged while driving because the engine turns too slow).

This was purely a publicity stunt, but it did prove that roadable airplanes can be practical and take their wings with them on the highway (it was windy and raining, also) and it must be remembered that this was a standard 1946 Ercoupe with no alterations, but equipped with the Holland folding wing device. Think how practical an airplane can be, if designed for roadability—no more weather problems and no more hangar problems. Incidentally, I keep this plane at home in a garage.

Wismer Holland
Municipal Airport
Valdosta, Georgia

Bendix Products

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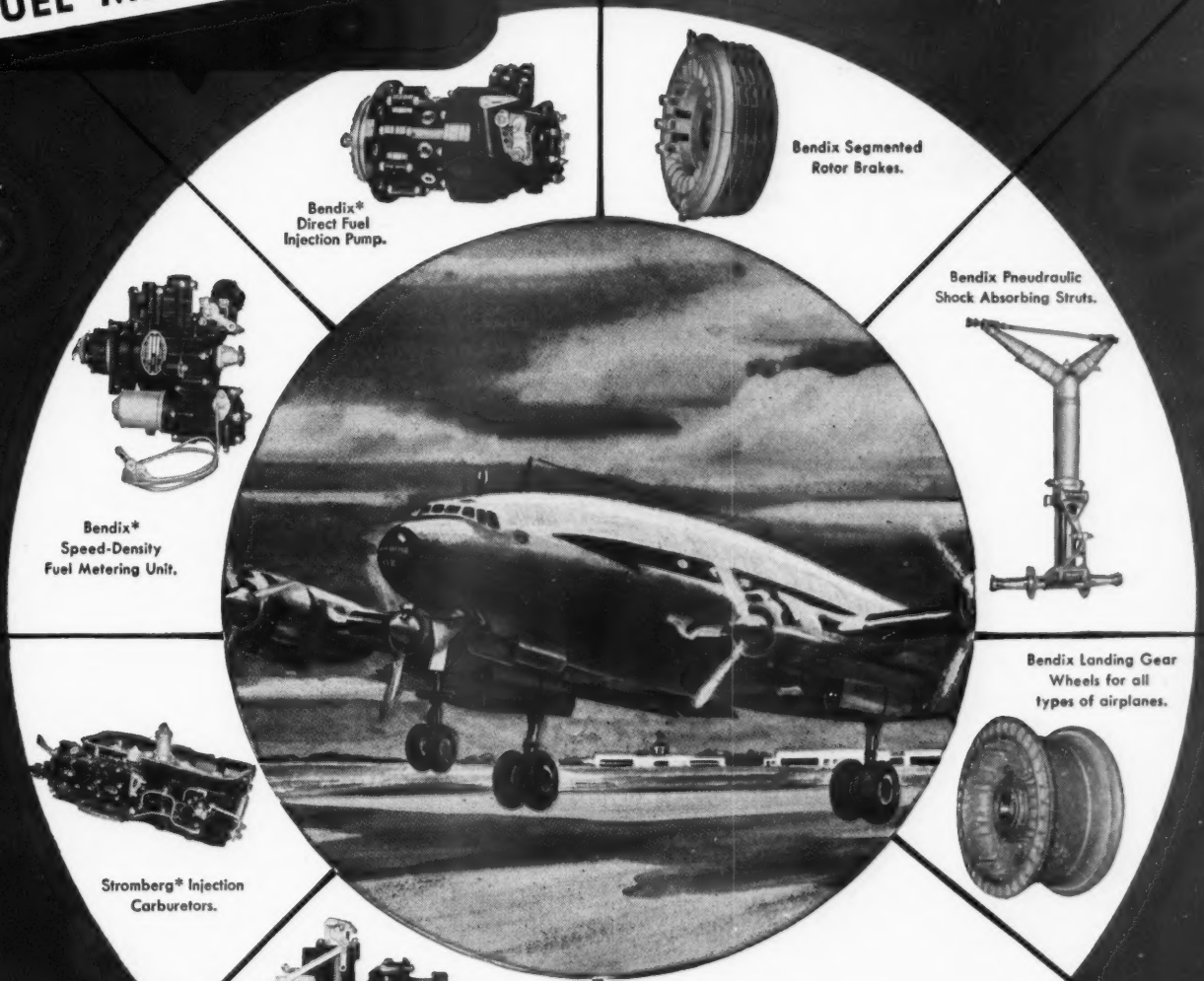

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Bendix* Fuel Metering Unit for jet engines.

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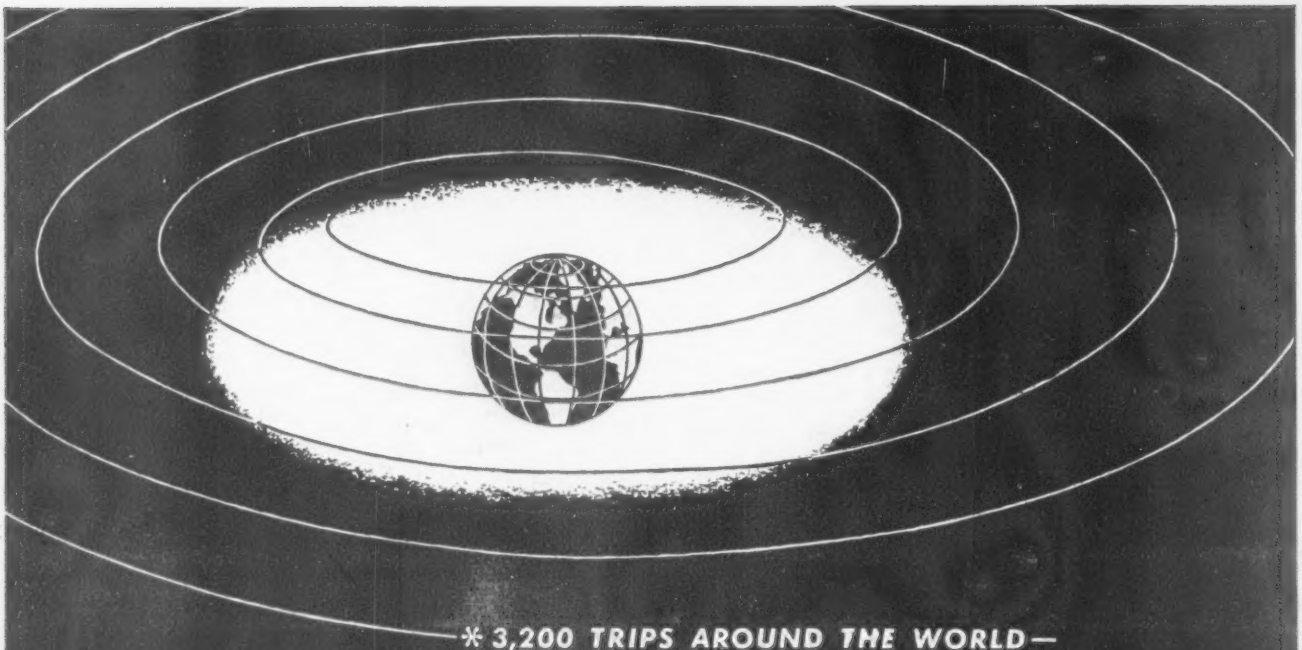

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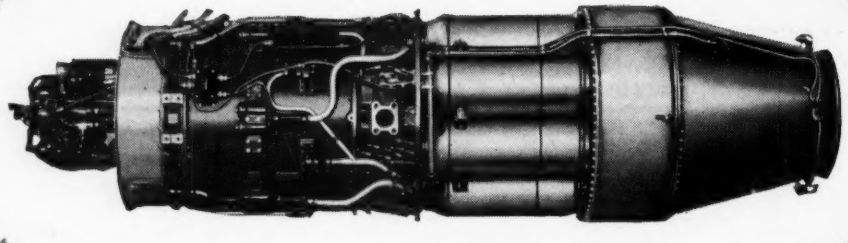

J-35 Axial-flow Turbo-jet

Allison jet-powered airplanes:
Lockheed F-80 and TF-80 Shooting Star
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Northrop F-89A Scorpion
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